



**Tri-Service CADD/GIS
Technology Center**

CADD Details Library

Report 3 Electrical Details

Approved For Public Release; Distribution Is Unlimited

Library of CADD Details

Report 1	Architectural Details
Report 2	Mechanical Details
Report 3	Electrical Details
Report 4	HTRW Details
Report 5	Structural Details
Report 6	Civil/Site Details

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CADD Details Library

Report 3 Electrical Details

by Tri-Service CADD/GIS Technology Center
U.S. Army Engineer Research and Development Center
Waterways Experiment Station
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Report 3 of a Series

Approved for public release; distribution is unlimited

Waterways Experiment Station Cataloging-in-Publication Data

CADD details library / by Tri-Service CADD/GIS Technical Center.

6 v. : ill. ; 28 cm. — (Technical report ; CADD-93-1 repts.1-6 1999)

Includes bibliographical references.

rept. 1. Architectural details (updated)—rept. 2. Mechanical details (updated)—rept. 3. Electrical details (updated)—rept. 4. HTRW details (updated)—rept. 5. Structural details—rept. 6. Civil/Site details—rept.

1. Computer-aided design. 2. Computer-aided engineering. 3. Architectural drawing—Detailing — Computer programs. I. United States. Army. Corps of Engineers. II. U.S. Army Engineer Research and Development Center. III. Tri-Service CADD/GIS Technology Center (U.S.) IV. Title: Architectural details. V. Series: Technical report (U.S. Army Engineer Research and Development Center) ; CADD-93-1 repts.1-6 1999.

TA7 W34 no.CADD-93-1 repts.1-6 1999

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SF 298

Summary

Several years ago, before computer-aided design and drafting (CADD) became the standard drafting tool in design, a seasoned draftsman might require, on the average, 40 hours to develop a sheet of construction details by hand. Through the use of CADD, the effort of creating a single detail has been reduced considerably. Once the designer has created a detail using CADD tools, he/she can save the detail to a file and use the detail over and over in different construction projects. Eventually, the designer will have compiled a library of details that he/she will consistently use. These details can be easily inserted into a detail sheet and then modified to meet the project requirements and specifications. This development and reuse of CADD details represents a considerable time-savings tool to the designer.

When the Tri-Service CADD/GIS Technology Center (the Center) was established in 1992, one of the first tasks was the compilation of a CADD Details Library utilizing details created by tri-service personnel. The Center did not expend design funds to hire an architect/engineer or use in-house resources to develop completely new details; instead these tri-service details were organized into a generic format and cataloged by type.

To further simplify the use of the details library, the former Architectural Automation Field Working Group (AAFWG) tasked the Center to develop an icon-driven software retrieval system. Developed using MDL and AutoLISP programming, the retrieval software

ran on both MicroStation and AutoCAD platforms using UNIX, DOS, Windows, Windows NT, and Windows 95 operating systems.

Typically, detailing on a design project does not begin prior to the 35-percent design phase. At the 35-percent phase, the designer has defined the building's structure and envelope requirements and is ready to begin selecting typical project details.

After reviewing details in hardcopy or electronic format and identifying usable details, the designer/draftsman initiates the "CADD Detail Manager" program. The designer scrolls through the details listing, identifies the desired detail, reviews it within the display box, selects the required scale, and then places it on the detail sheet. This process is repeated until the entire sheet is filled. Simple modifications to the details in order to meet specific job requirements/specifications complete the sheet. The designer may call up the CADD Detail Manager while in any design file, thus enabling detail placement anywhere within a set of drawings.

The CADD Details Library should always be considered a "living" library. Since the conception of the idea for this project, this philosophy has proven to be true. In 1995 the Center released the first CADD Details Library CD-ROM to enthusiastic response. The first CD-ROM contained over 1,200 details representing the Architectural; Mechanical; Electrical; and Hazardous, Toxic,

and Radioactive Waste disciplines. User demand resulted in the addition of Civil/Site, Structural, Interior Design, and Landscape Architectural details to the current edition of the CADD Details CD-ROM. With the push toward using the metric system in the tri-services, 100 of the architectural details contained in the first CD-ROM were converted to metric format. Because of the desire for a “paperless” environment, all documents related to the current version of the CADD Details Library have been released totally in electronic format on the CD ROM. This gives the designer the option of printing out only the documents (or only the pages) that he/she requires, thereby

saving printing costs for the Center. Through efforts such as these, the CADD Details Library will continue to grow to include all the design disciplines with costs incurred for technical review/modification, CD-ROM reproduction, and distribution.

It is the Center’s hope that the efforts of the Center, with the backing of the former Field Working Groups and the currently existing Design/Construction Field Working Group, to develop comprehensive, multidiscipline sets of generic details will not only help designers in their daily work but also demonstrate the tri-service commitment to CADD productivity.

Preface

This report is the third volume of a series of reports consisting of architectural; mechanical; electrical; hazardous, toxic, and radioactive waste (HTRW); structural; and civil/site details. These reports are part of the Tri-Service CADD/GIS Technology Center's (the Center) initiative to develop a standard methodology for the development, documentation, and use of generic design details in computer-aided design and drafting (CADD) systems. By providing both a startup set of details and a menu-driven software retrieval program, the Center hopes to ensure easy accessibility to generic design details and encourage their use in the CADD environment.

It must be emphasized that the intent of this document is not to provide "Standard Details," but to furnish CADD users with a starting point for the development of project-specific details. Although reasonable efforts have been made to verify that the enclosed details are technically correct and meet existing, generally available building code requirements, there is no expressed or implied warranty of correctness or compliance. It is the final responsibility of the user/designer to ensure the accuracy, completeness, applicability, workability, and code compliance of all details whether used or misused in whole or in part.

Project Manager for the CADD Details Library was Stephen C. Spangler of the

Center. Original authors of the CADD Details Library reports were James T. Wilson and Stephen C. Spangler of the Center. Chief of the Center was Harold L. Smith. The Center is located in the Information Technology Laboratory (ITL), U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, a complex of five laboratories of the U.S. Army Engineer Research and Development Center (ERDC). Director of ITL was Dr. N. Radhakrishnan, and Commander of ERDC was COL Robin R. Cababa, EN. This report was prepared and published at the WES complex of ERDC.

The Center would like to thank Mr. Stan Shirk, Omaha District, for his continued devotion and efforts to the CADD Details Library project. The Center would also like to recognize Mr. Todd Blakley, formerly of the Sacramento District, for his contributions as former chairman of the Design/Construction Field Working Group's (FWG) Details Subcommittee. A special acknowledgment goes to Mr. Stephen Goodin, South Atlantic Division, and Mr. Alain Bernier, Southwestern Division, for their support in the initial development of the details library concept.

The Tri-Service CADD/GIS Technology Center would like to acknowledge the contributions of the following sites who helped in submitting and/or formatting details for this release of the CADD Details Library.

Brooks Air Force Base

Department of Veterans Affairs

Naval Air Station, Fort Worth

NAVFACENGCOM, Western Division

Navy Public Works Center,
Washington, D.C.

Tinker Air Force Base

U.S. Army Corps of Engineers,
Charleston District

U.S. Army Corps of Engineers,
Fort Worth District

U.S. Army Corps of Engineers,
Little Rock District

U.S. Army Corps of Engineers,
Mobile District

U.S. Army Corps of Engineers, Omaha
District

U.S. Army Corps of Engineers,
Pacific Ocean Division

U.S. Army Corps of Engineers,
Pittsburgh District

U.S. Army Corps of Engineers,
Sacramento District

U.S. Army Corps of Engineers,
Seattle District

U.S. Army Corps of Engineers,
Transatlantic Programs Center

U.S. Army Engineering and Support
Center, Huntsville

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Engineers, Sacramento District

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Beneficial comments (recommendations,
enhancements, deletions, etc.) which may be
of use in improving this document should be
addressed to:

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Development Center, Waterways
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1 Introduction

The use of computer-aided design and drafting (CADD) systems within the Department of Defense (DoD) has produced an increase in design efficiency while netting an appreciable reduction in overall design cost. In some offices, a 30- to 40-percent reduction in design/drafting man-hours, over the traditional “on-the-board” design effort, has been realized. These improvements have been achieved through the utilization of discipline-specific CADD design packages, the sharing of CADD-developed project information, and the reuse of design information. Recognizing the increased productivity represented in the reuse and adaptation of design and construction details, the Tri-Service CADD/GIS Technology Center (the Center) initiated a project to collect and disseminate generic design details within the DoD.

Based on work completed by the former Mechanical Field Working Group in November 1991, and ongoing work by the former Electrical and Architectural Automation Field Working Groups, the Center recognized the necessity to pool the resources of all DoD design disciplines to ensure

consistency in detail development. Issues concerning scale, levels/layers, line thickness, text, colors, layout, naming convention, and file storage/retrieval procedures needed to be resolved to the satisfaction of all the design disciplines before the Center could continue. The Center tasked the former Architectural Automation Field Working Group to prepare applicable criteria and procedures for standardizing the development of the CADD Details Library.

In accordance with the Metric Conversion Act of 1975 (Public Law 94-168) as amended by the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418), and Executive Order (EO) 12770 dated July 25, 1991, this and future editions of the CADD Details Library will include Standard International (metric) details. Appendix B contains information on changes that will occur in design drawings and construction as a result of the conversion to the metric system.

2 CADD Details Library

Library Creation

“Evolution” is the best description of the process for incorporating the suggested format for creating generic details. Agencies currently developing detail libraries are encouraged to begin incorporating the format into their daily design efforts, and not attempt a complete revamping of their existing detail libraries. As details are created, they should be included in the agency’s detail library and submitted to the Center for possible inclusion in the DoD-wide master library. By no means should the CADD Details Library ever be considered a completed product. It is only the **beginning** of what should be a daily routine of adding and revising details for all design disciplines within the tri-services.

Detail Integrity

Although a liability disclaimer covering all the details is included as part of the CADD Details Library, each detail submitted for inclusion into the library should be reviewed by the submitting agency for integrity and compliance with current design criteria. It will be extremely helpful to the Center and the Design/Construction Field Working Group’s Details Subcommittee if each detail is properly reviewed prior to submitting it for placement into the Library.

Creating a Detail

Graphics

When developing a detail, draw the detail at full size (1 inch = 1 inch (inch-pound) or 1 mm = 1 mm (metric)) (Figure 1). Each detail should exist in an individual drawing file, either in AutoCAD’s .dwg or MicroStation’s .dgn formats. MicroStation details should not be created as cells or as part of a cell library. AutoCAD details should not be saved as blocks or blocks written out to a file (wblocks).

For detail uniformity, a standard detail layout has been developed (Figures 2 and 3). This box is only a guide for laying out details; it is understood that not all details can fit into the layout. When producing details larger than the standard detail layout box, every effort should be made to follow the format as much as possible. For example, keep the detail origin and title in the lower left corner of the detail and try to use multiples of the standard detail layout box (2 high, 2 wide, etc.).

Working units

For MicroStation details, the working units should be set to 1:12:8000 (ft:in:PU) for inch-pound details and 1:1:10 (mm:none:PU) for metric details. For AutoCAD details, the default “UNITS” setting should be “#4 Architectural” for inch-pound details and “#2 Decimal” for metric details.

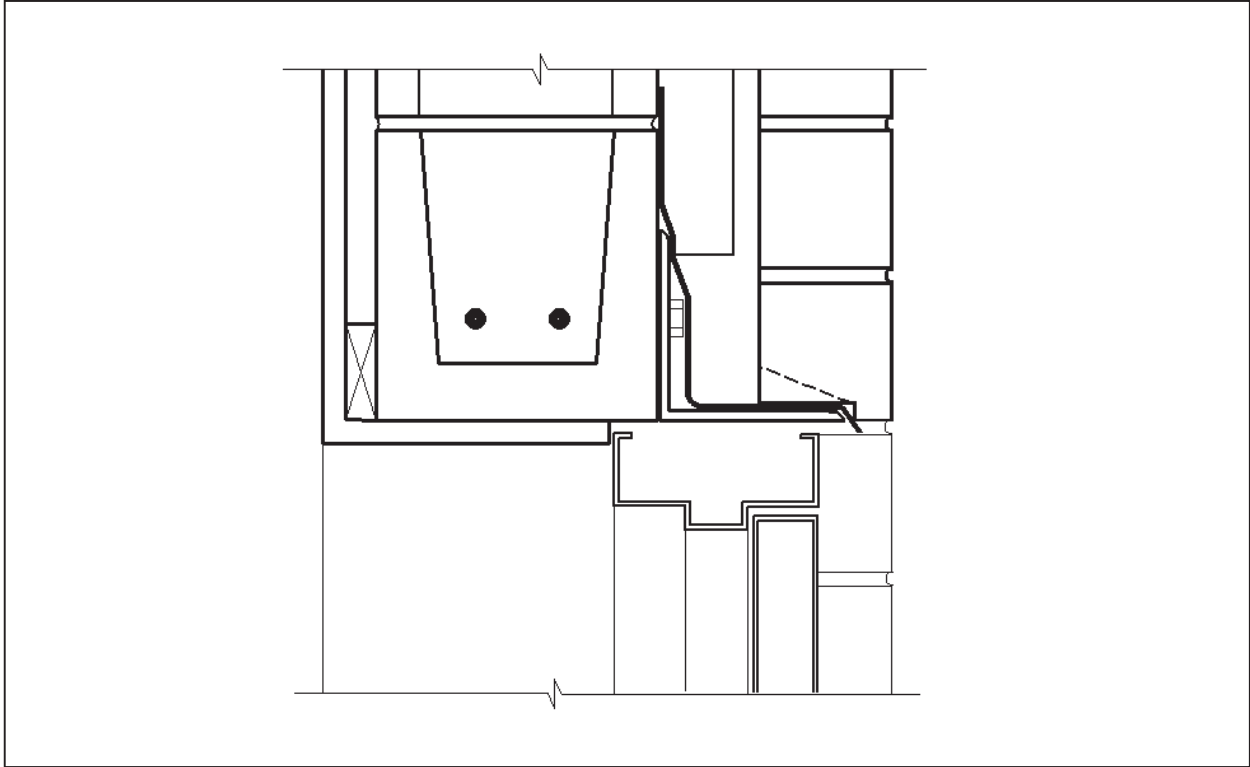


Figure 1. Detail drawn at full size

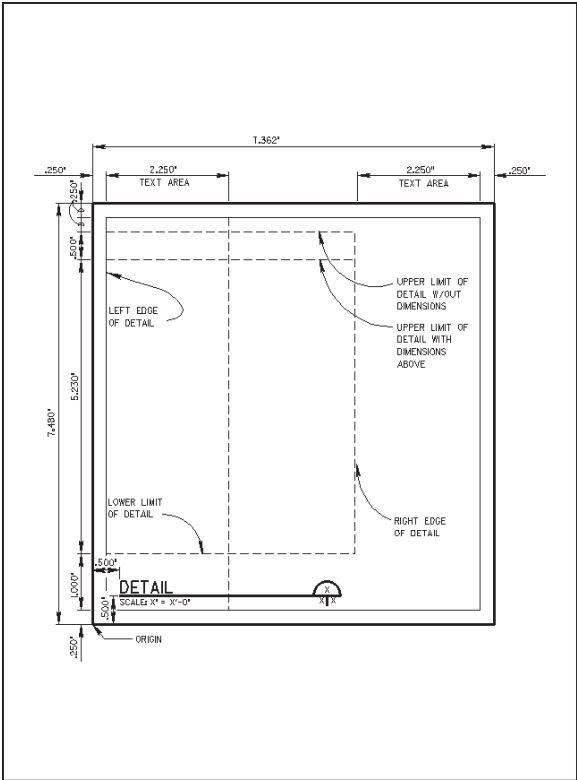


Figure 2. Inch-pound detail layout box

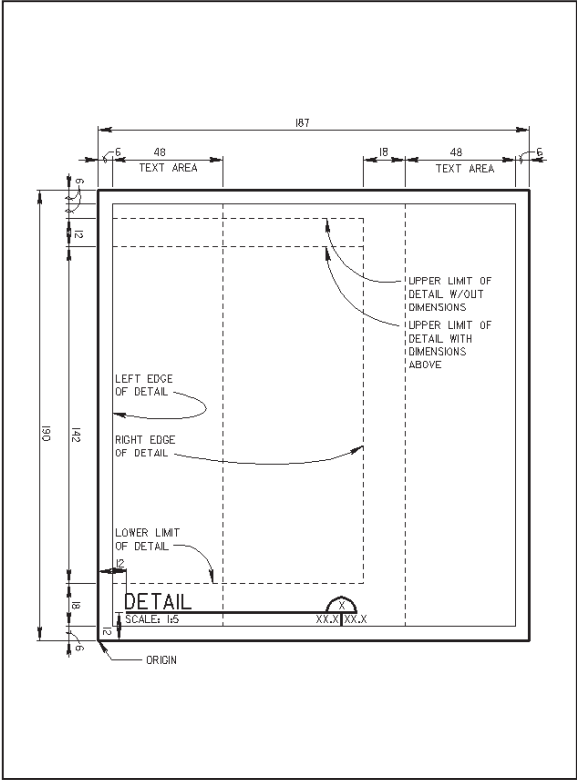


Figure 3. Metric detail layout box

Levels/layers

The previous edition of the CADD Details Library proposed a level/layer scheme based on the pen weight at which graphics would be plotted. Feedback from the field indicated that this was too restrictive and unclear. Users want to be able to “turn off” individual components of a detail versus all items drawn at a certain line weight. For instance, a designer may want to be able to turn off the CMU in a detail but not the reinforcing rebar.

As a result of this input, levels/layers for details have been developed for Release 1.8 of the Tri-Service A/E/C CADD Standard (Table 1). Levels/layers are grouped into the most common construction materials/items required to create a particular discipline’s details.

Color/line widths

The primary purpose of color is to provide a drawing with visual depth and clarity or, in some CADD systems, to assign plotted line widths. The previous edition of the CADD Details Library established a specific color and line weight to each level/layer. Users found this guideline to be too restrictive. Often a user will want to show items on the same level/layer at different line weights to emphasize particular parts of a detail over others. As a result, the user may use any of the colors shown in Table 2 to create details. However, the line weights shown in the table beside each color *have* to be associated with that color in order to ensure that details are plotted at the correct visual weight.

Patterning/hatching

Patterning/hatching should be added to the detail on level/layer E-ANNO-PATT (Figure 4). When the detail is being patterned or hatched, only the default pattern or hatch libraries supplied with MicroStation or AutoCAD should be used.

Text

After the scale of the detail is determined, text should be placed at heights corresponding to Tables 3 and 4. This ensures that all notes and dimensions will be plotted at a height of 1/8 inch (3 mm) and the detail title will be plotted at a height of 1/4 inch (6 mm). For example, in Figure 5, the notes should be placed at a height of 1/2 inch and the detail title should be placed at a height of 1 inch for a detail that is plotted at a scale of 3" = 1' - 0". The text style used for details should be Font 1 for MicroStation users and “ROMANS” for AutoCAD users.

Abbreviations

Abbreviations for words or phrases frequently used in details should be as noted in Appendix A. When possible, abbreviations should be kept to a minimum. Other abbreviations, particularly discipline-unique abbreviations, may be used but must not conflict with those in Appendix A.

Detail Naming

File names for the master set of details are based on *UniFormat* (Interim Edition) produced by the Construction Specifications Institute (CSI); *UniFormat* is used with permission from CSI. *UniFormat* may be purchased from CSI by calling (800)689-2900. Level 1 and Level 2 *UniFormat* categories are used for the first three alphanumeric characters of the file name. The Code, Sub-Code, Detail Number, and graphic type characters are non-*UniFormat* conventions developed specifically by the Center for the CADD Details Library file naming methodology (see Figure 6).

Table 1
Electrical Detail Levels/Layers

Level #	Level/Layer Name	Level/Layer Description
1	E-ANNO-DIMS	Witness/extension lines, dimension arrowheads/dots/slashes, dimension text
3	E-ANNO-NPLT	Construction lines, area calculations, review comments
4	E-ANNO-PATT	Patterning/hatching
6	E-ANNO-SYMB	Reference bubbles, matchlines and breaklines
7	E-ANNO-TEXT	Detail title text, leaderlines/arrowheads and associated text, notes
9	E-DETL-GENF	General features
11	E-DETL-ARCH	Architectural features
14	E-DETL-BUSS	Bus bars and rods
15	E-DETL-CABS	Cabinets and enclosures
37	E-DETL-INSL	Insulators
39	E-DETL-LTFX	Light fixtures
42	E-DETL-MOTR	Motors
44	E-DETL-PIPE	Piping and conduit
49	E-DETL-STRC	Structural features
52	E-DETL-TRAY	Cable trays
57	E-DETL-WIRE	Wire and cables
58	E-DETL-XFRM	Transformers

Table 2
Color/Line Width Guidelines

Color	AutoCAD Color #	MicroStation Color #	Line/Pen Width
Blue	5	1	0.007 in. (0.18 mm), LW = 0
Grey	8	9	0.007 in. (0.18 mm), LW = 0
Red	1	3	0.010 in. (0.25 mm), LW = 1
Green	3	2	0.010 in. (0.25 mm), LW = 1
Yellow	2	4	0.014 in. (0.35 mm), LW = 2
Magenta	6	5	0.014 in. (0.35 mm), LW = 2
Cyan	4	7	0.020 in. (0.50 mm), LW = 3
White	7	0	0.028 in. (0.70 mm), LW = 5

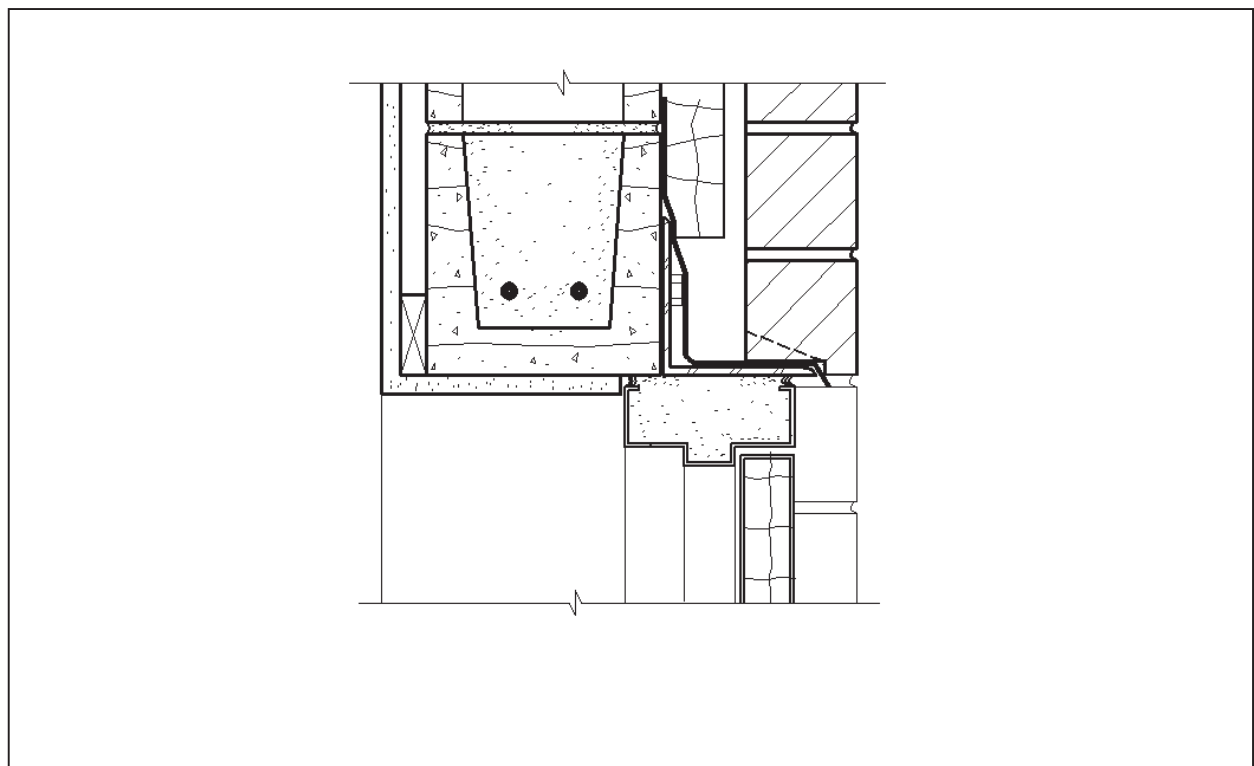


Figure 4. Patterning/hatching added to detail

Table 3
Inch-Pound Text Heights

Detail Scale	Height at which Notes and Dimensions Should be Placed	Height at which Detail Title Text Should be Placed
1/32 in. = 1 ft - 0 in.	4 ft	8 ft
1/16 in. = 1 ft - 0 in.	2 ft	4 ft
1/8 in. = 1 ft - 0 in.	1 ft	2 ft
1/4 in. = 1 ft - 0 in.	6 in.	1 ft
3/8 in. = 1 ft - 0 in.	4 in.	8 in.
1/2 in. = 1 ft - 0 in.	3 in.	6 in.
3/4 in. = 1 ft - 0 in.	2 in.	4 in.
1 in. = 1 ft - 0 in.	1-1/2 in.	3 in.
1-1/2 in. = 1 ft - 0 in.	1 in.	2 in.
3 in. = 1 ft - 0 in.	1/2 in.	1 in.
6 in. = 1 ft - 0 in.	1/4 in.	1/2 in.
Full Size	1/8 in.	1/4 in.

Table 4
Metric Text Heights

Detail Scale	Height at which Notes and Dimensions Should be Placed	Height at which Detail Title Text Should be Placed
1 : 200	600 mm	1200 mm
1 : 125	375 mm	750 mm
1 : 100	300 mm	600 mm
1 : 75	225 mm	450 mm
1 : 50	150 mm	300 mm
1 : 25	75 mm	150 mm
1 : 20	60 mm	120 mm
1 : 10	30 mm	60 mm
1 : 5	15 mm	30 mm
1 : 2.5	7.5 mm	15 mm
Full Size	3 mm	6 mm

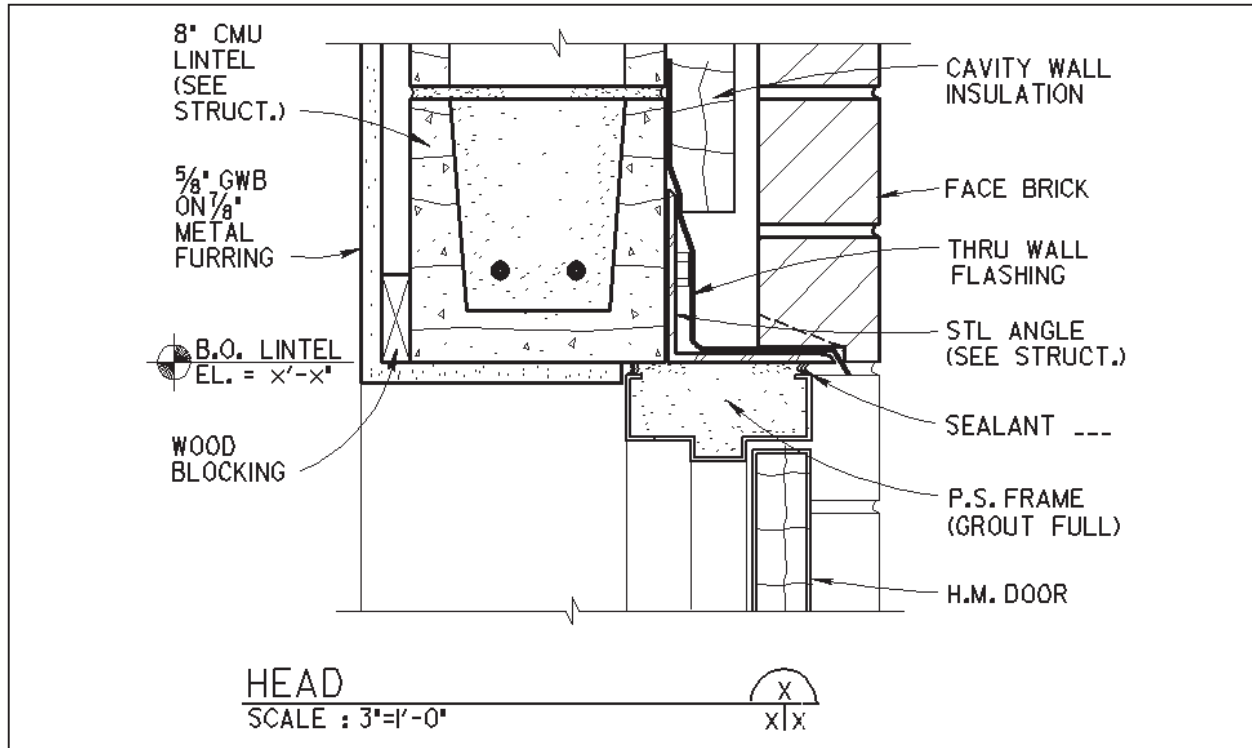


Figure 5. Text, dimensions, leader lines, and titles added to detail

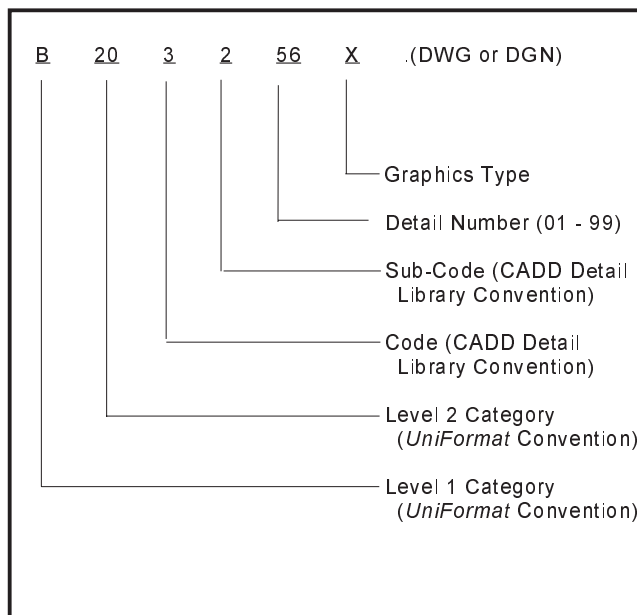


Figure 6. Naming convention. Note: A full listing of *UniFormat* categories and codes is outlined in Chapter 5, "Index of Details"

An example of a detail name is provided below.

EXAMPLE: A102352P.dwg

Level 1 Category:

A = Substructure

Level 2 Category:

10 = Foundations

Code:

2 = Special Foundations

Sub-Code:

3 = Shoring and Underpinning

Detail Number:

52 = Detail #52

Graphics Type:

E = Elevation P = Plan
I = Isometric S = Schematic
N = Notes X = Section

3 CADD Detail Manager

Introduction

The CADD Details Library is supplied on a CD-ROM with a menu-driven retrieval system called the CADD Detail Manager (CDM). The CDM allows the user to select border sheets, preview details, and scale details for proper placement into a drawing file.

Details are located within the CDM by selecting a Discipline (e.g., Architectural, Mechanical, etc.), a combination of Level 1 and Level 2 Categories (e.g., Exterior Closure, Roofing, etc.), and the Detail Code (e.g., Exterior Walls, Exterior Windows, etc.). Once all three selections are made, a list of details within the selected code for that discipline will be displayed. Individual details may be previewed by selecting (highlighting) the detail names displayed within the list box. Choosing the appropriate scale and inserting the detail into the current drawing completes the selection/placement process.

Startup

Although the AutoCAD and MicroStation versions of the CDM function similarly, there are minor differences in the way these utilities work. These differences will be discussed in the following sections.

MicroStation Version (95/SE)

The MicroStation version of the CADD Detail Manager was developed using MicroStation Development Language (MDL). To start the CADD Detail Manager, create a new or open an existing design file. In the MicroStation Key-in window, enter the following command:

mdl load detail

When this command is entered, the CADD Detail Manager disclaimer box will open. After the “OK” button is clicked, the CADD Detail Manager Setup box will appear (Figure 7). From this point on, the use of the CADD Detail Manager in either AutoCAD or MicroStation is the same (see “CADD Detail Manager Setup”).

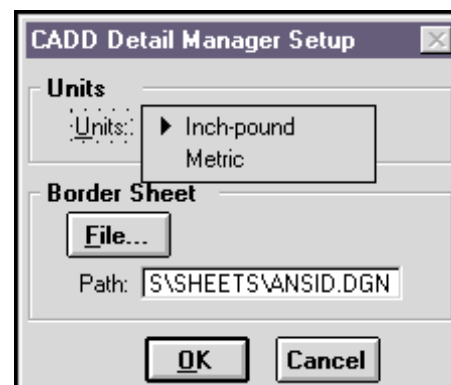


Figure 7. Detail Manager Setup box

AutoCAD Version (Release 13/14)

The AutoCAD version of the CADD Detail Manager was developed using AutoLISP. To start the CADD Detail Manager within AutoCAD, first open a new drawing. At the Command line, the following needs to be typed:

Command: CDM

When this command is entered, the CADD Detail Manager disclaimer box will open. After clicking on the “OK” button, the user will have the choice of either starting a new detail sheet or opening an existing detail sheet (Figure 8).



Figure 8. New or existing sheet option box

Choosing the New option from Figure 8 starts the CADD Detail Manager Setup (Figure 7). From this point, the use of the CADD Detail Manager in either AutoCAD or MicroStation is the same.

Choosing the Existing option will allow the user to search for an existing details sheet using a file manager routine (Figure 9).

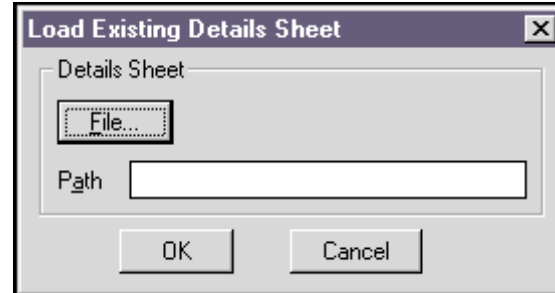


Figure 9. Existing details sheet file search

CADD Detail Manager Setup

As shown in Figure 7, the user first has to set the units of the drawing—either inch-pound or metric. The user then has the option of selecting an existing border sheet file, one of the metric border sheets included on the CADD Details Manager CD, or no border sheet at all. If an existing border sheet is chosen, that sheet has to have been drawn full size (e.g., an ANSI D size border sheet has to measure 22 in. by 34 in.). Once all desired settings have been chosen, click the “OK” button, which will start the CADD Detail Manager.

Note: In MicroStation, if inch-pound units are chosen, the working units are reset to 1:12:8000 and for metric units, the working units are reset to 1:1:10 (Figure 10). These working units conform to those mandated in Release 1.8 of the Tri-Service A/E/C CADD Standard.

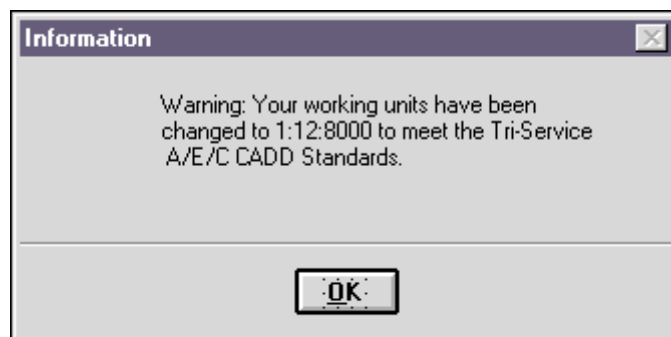


Figure 10. Working units warning box

CADD Detail Manager Use

Within the CADD Detail Manager (Figure 11), details are cataloged first by discipline (i.e., Architectural, Electrical, Mechanical, etc.). Once a discipline is chosen, the user then can select from different UniFormat Level 2 Categories and Detail Codes until a list of details within those selections appears. Each line within the resulting list of details gives three pieces of information: the name of the detail, the detail description, and the insertion scale for that detail. Clicking on a particular detail causes an image of that detail to appear in the Preview box.

Before a desired detail can be inserted, the correct insertion scale for that detail needs to be set (as mentioned previously, the insertion scale is listed along with the detail name and description in the Available Details list box). To set the insertion scale, click the “Scale” button. The user will then be taken to a scale conversion dialog box (Figure 12). From this box, the scale matching that noted in the detail description should be chosen (Note: the user must select

a scale, otherwise the detail will not insert at the proper size). Once the correct scale is chosen, the user will be taken back to the CADD Detail Manager screen (Figure 11), where the “Insert” option should be chosen. The user will then be allowed to drag the detail to the desired position and insert it into the drawing. This detail should then be edited/modified to meet site-specific requirements. Similarly, more details can be inserted into the existing drawing until a complete sheet of details is created.

Other Installation Options

As delivered, the setup routines included with the CADD Details Library CD install configuration files that point to the CD-ROM drive as the location for certain files. It is possible that a site may want these files shared over a server. In order to locate the details files, the installed configuration files need to be edited to point to the new location. In AutoCAD, this file is called `cdm_set.dfs` and is saved to the AutoCAD “Support” directory. In MicroStation, this

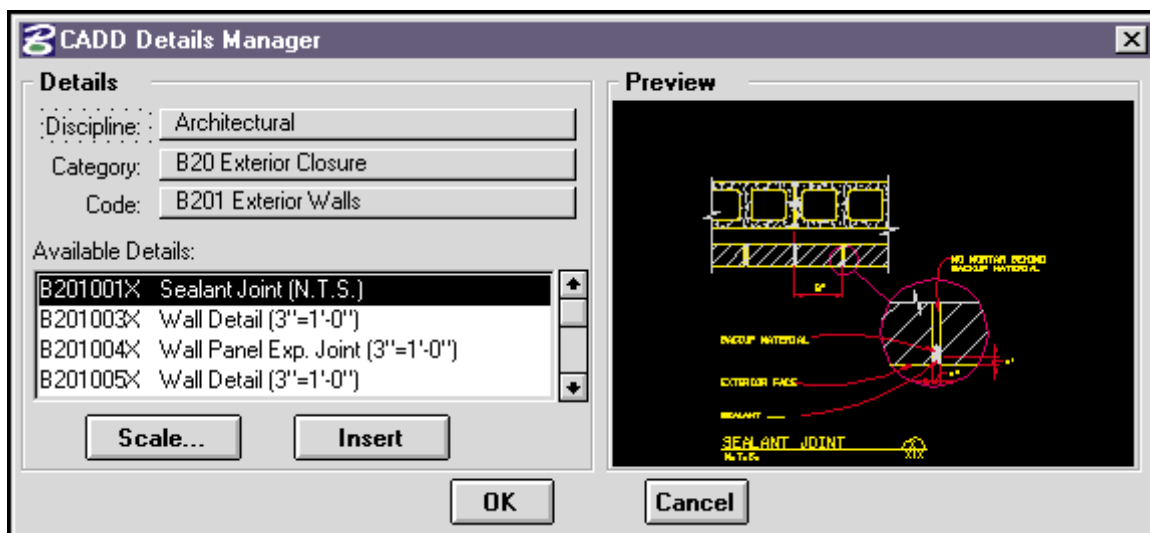


Figure 11. CADD Detail Manager

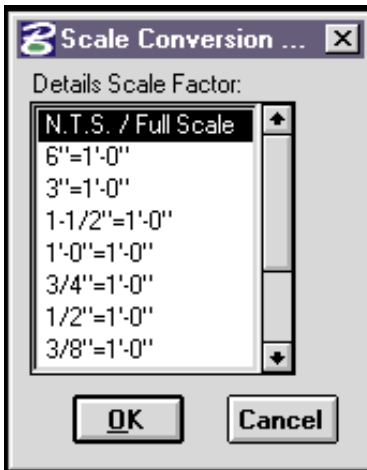


Figure 12. Scale conversion

file is called `ustncfg.dos` and is stored in a new directory called “Details” under the

MicroStation directory. Both configuration files contains directory paths similar to the following (in this case, the CD-ROM drive was E:):

E:\DETAILS\SHEETS\ANSID.DGN

C:\win32app\USTN95\DETAILS\SETUP.UNI

E:\DETAILS\INDEX\

E:\DETAILS\USTN\

If the files contained within the directory “Details” on the CD are copied to a server or another location, then the path to those files needs to be changed appropriately.

4 Design/Construction Field Working Group

The Design/Construction Field Working Group (FWG) is composed of architects, interior designers, and engineers from various design agencies within the Army, Navy, Air Force, and Corps of Engineers. The Design/Construction FWG's primary function is to serve as a leader in the improved usage of CADD technology as it relates to the design disciplines. The group reviews and reports

on the status of CADD within the tri-services, recommends and/or prepares standards, and implements productivity enhancements within DoD.

Table 5 lists current Design/Construction FWG members.

Table 5
Design/Construction Field Working Group

Member	Site	Service
Brenda Langheld	Brooks AFB	Air Force
James Roesch	Grand Forks AFB	Air Force
Larry Strother	Tyndall AFB	Air Force
Sharrol Toenjies	Scott AFB	Air Force
David Gutierrez	Fort Sam Houston	Army
Mike Luhrman	Fort Sam Houston	Army
Alex Shum	Fort Sam Houston	Army
Robert Weaver	Fort Carson	Army
Richard Allwes	Pittsburgh District	Corps
Lisa Edwards	Huntington District	Corps
Ghassem Khosrownia	Sacramento District	Corps
Stan Shirk	Omaha District	Corps
Marsha Walkup	Kansas City District	Corps
Gary Boyd	Southern Division	Navy
James Gale	Atlantic Division	Navy
Edward Ruckle	Southwest Division	Navy

5 Index of Details

Note: “*” = .dgn/.dwg
“**” = metric version of detail
available

A SUBSTRUCTURE

A10 FOUNDATIONS

A101 Standard Foundations

- A1010 Misc. Standard Foundation Details
- A1011 Wall Foundations
- A1012 Column Foundations

A102 Special Foundations

- A1020 Misc. Special Foundation Details
- A1021 Driven Piles
- A1022 Bored/Augured Piles
- A1023 Shoring and Underpinning
- A1024 Dewatering
- A1025 Raft Foundations
- A1026 Cofferdams

A103 Slabs on Grade

- A1030 Misc. Slab on Grade Details
- A1031 Standard Slabs on Grade
- A1032 Structural Slabs on Grade
- A1033 Inclined Slabs on Grade
- A1034 Trenches
- A1035 Pits and Bases
- A1036 Subdrainage Systems
- A1037 Perimeter Insulation

A20 BASEMENT CONSTRUCTION

A201 Basement Excavation

- A2010 Misc. Basement Excavation Details
- A2011 Excavation for Basement

- A2012 Backfill and Compaction
- A2013 Excavation Support Systems

A202 Basement Walls

- A2020 Misc. Basement Wall Details
- A2021 Basement Wall Construction
- A2022 Basement Wall Vertical
Waterproofing
- A2023 Basement Wall Dampproofing
- A2024 Basement Wall Vapor Retarders
and Insulation
- A2025 Basement Wall Interior Skin

B SHELL

B10 SUPERSTRUCTURE

B101 Floor Construction

- B1010 Misc. Floor Construction Details
- B1011 Floor Structural Frame
- B1012 Structural Interior Walls Supporting
Floors
- B1013 Floor Decks, Slabs and Sheathing
- B1014 Balcony Floor Construction
- B1015 Mezzanine Construction
- B1016 Ramps
- B1017 Floor Construction Vapor Retarders,
Air Barriers, and Insulation
- B1018 Floor Construction Fireproofing
- B1019 Floor Construction Firestopping

B102 Roof Construction

- B1020 Misc. Roof Construction Details
- B1021 Roof Structural Frame
- B1022 Structural Interior Walls Supporting
Roofs

- B1023 Roof Decks, Slabs, and Sheathing
- B1024 Canopies
- B1025 Roof Construction Vapor Retarders, Air Barriers, and Insulation
- B1026 Roof Construction Fireproofing
- B1027 Roof Construction Firestopping

B103 Typical Structural Details

- B1030 Misc. Details
- B1031 Steel Details
- B1032 Concrete Details
- B1033 CMU Details
- B1034 Timber Details

B20 EXTERIOR CLOSURE

B201 Exterior Walls

- B2010 Misc. Exterior Wall Details
- B2011 Exterior Wall Exterior Skin/Interior Skin
- B2012 Exterior Wall Construction
- B2013 Exterior Wall Vapor Retarders, Air Barriers, and Insulation
- B2014 Exterior Wall Assemblies
- B2015 Parapets
- B2016 Exterior Louvers, Grilles, and Screens
- B2017 Exterior Protection Devices for Openings
- B2018 Exterior Balcony Walls and Railings
- B2019 Exterior Soffits

B202 Exterior Windows

- B2020 Misc. Exterior Window Details
- B2021 Exterior Standard Windows
- B2022 Storefronts
- B2023 Glazed Curtain Walls
- B2024 Exterior Special Windows

B203 Exterior Doors

- B2030 Misc. Exterior Door Details
- B2031 Exterior Entrance Doors
- B2032 Exterior Utility Doors
- B2033 Large Exterior Special Doors
- B2034 Special Use Exterior Doors
- B2035 Exterior Gates

B30 ROOFING

B301 Roof Coverings

- B3010 Misc. Roof Covering Details
- B3011 Deck Vapor Retarders and Insulation
- B3012 Shingles and Roofing Tiles
- B3013 Manufactured Roofing
- B3014 Membrane Roofing
- B3015 Traffic Coatings
- B3016 Sheet Metal Roofing
- B3017 Flashing and Sheet Metal
- B3018 Roof Specialties and Accessories
- B3019 Manufactured Exterior Specialties

B302 Roof Openings

- B3020 Misc. Roof Opening Details
- B3021 Skylights

C INTERIORS

C10 INTERIOR CONSTRUCTION

C101 Interior Partitions

- C1010 Misc. Interior Partition Details
- C1011 Interior Fixed Partitions
- C1012 Interior Demountable Partitions
- C1013 Interior Operable Partitions
- C1014 Interior Balustrades and Screens
- C1015 Interior Windows
- C1016 Interior Glazed Partitions and Storefront
- C1017 Interior Partition Firestopping

C102 Interior Doors

- C1020 Misc. Interior Door Details
- C1021 Interior Swinging Doors
- C1022 Interior Entrance Doors
- C1023 Interior Fire Rated Doors
- C1024 Interior Sliding and Folding Doors
- C1025 Interior Large Doors
- C1026 Interior Special Use Doors
- C1027 Interior Gates

C103 Interior Specialties

- C1030 Misc. Interior Specialty Details

- C1031 Visual Display Boards, Telephones, Identifying Devices, and Postal Specialties
- C1032 Compartments and Cubicles
- C1033 Interior Louvers and Vents
- C1034 Service Wall Systems and Wall and Corner Guards
- C1035 Fireplaces and Stoves
- C1036 Pedestrian Control Devices
- C1037 Lockers, Wardrobes, Closet, Storage, and Shelving Specialties
- C1038 Toilet and Bath Accessories (Scales)

C20 STAIRWAYS

C201 Stair Construction

- C2010 Misc. Stair Construction Details
- C2011 Cast-in-Place Stair Construction
- C2012 Precast Concrete Stair Construction
- C2013 Metal Stair Construction
- C2014 Wood Stair Construction
- C2015 Fire Escapes

C202 Stair Finishes

- C2020 Misc. Stair Finish Details
- C2021 Tile Stair Finishes
- C2022 Terrazzo Stair Finishes
- C2023 Stone Stair Finishes
- C2024 Unit Masonry Stair Finishes
- C2025 Resilient Stair Finishes
- C2026 Carpet Stair Finishes
- C2027 Special Flooring Stair Finishes
- C2028 Stair Treatment/Painting
- C2029 Stair Railings/Soffits

C30 INTERIOR FINISHES

C301 Interior Wall Finishes

- C3010 Misc. Wall Finish Details
- C3011 Concrete Wall Finishes
- C3012 Wood Wall Paneling
- C3013 Lath and Plaster Wall Finishes
- C3014 Gypsum Board Wall Finishes
- C3015 Tile and Terrazzo Wall Finishes
- C3016 Stone Facing and Acoustical Wall Finishes
- C3017 Special Wall Finishes
- C3018 Wall Carpet

- C3019 Interior Wall Painting, Wall Coverings, and Special Interior Wall Coatings

C302 Interior Floor Finishes

- C3020 Misc. Floor Finish Details
- C3021 Concrete Floor Finishes
- C3022 Tile Floor Finishes
- C3023 Terrazzo Floor Finishes
- C3024 Wood Flooring
- C3025 Stone Flooring
- C3026 Unit Masonry Flooring
- C3027 Resilient Flooring
- C3028 Carpet Flooring
- C3029 Access and Special Flooring, Floor Treatment, and Floor Painting

C303 Interior Ceiling Finishes

- C3030 Misc. Interior Ceiling Finish Details
- C3031 Concrete Ceiling Finishes
- C3032 Wood Ceiling Paneling
- C3033 Lath and Plaster Ceiling Finishes
- C3034 Gypsum Board Ceiling Finishes
- C3035 Acoustical Ceiling Treatment
- C3036 Special Ceiling Surfaces
- C3037 Special Ceiling Coatings
- C3038 Interior Ceiling Painting

D SERVICES

D10 CONVEYING SYSTEMS

D101 Vertical Transportation Systems

- D1010 Misc. Details
- D1011 Dumbwaiters
- D1012 Elevators
- D1013 Escalators
- D1014 Lifts

D102 Other Transportation Systems

- D1020 Misc. Details
- D1021 Moving Walks
- D1022 Aircraft Passenger Loading Systems

D103 Other Conveying Systems

- D1030 Misc. Conveying Details

D1031 Material Handling Systems
D1032 Bridgecranes
D1033 Monorails
D1034 Jib Cranes
D1035 Misc. Hoists
D1036 Turntables
D1037 Scaffolding
D1038 Special Crane Supports

D20 PLUMBING SYSTEMS

D201 Plumbing Fixtures

D2010 Misc. Plumbing Fixture Details
D2011 Water Closets
D2012 Urinals
D2013 Lavatories
D2014 Sinks
D2015 Showers
D2016 Bathtubs
D2017 Basins
D2018 Drinking Fountains/Coolers
D2019 Other Plumbing Fixture Details

D202 Domestic Water Distribution

D2020 Misc. Details
D2021 Water Supply Piping Systems
D2022 Water Supply Plumbing Specialties
D2023 Water Supply Equipment
D2024 Water Supply Insulation
D2025 Electric Water Heater
D2026 Gas Fired Water Heater

D203 Sanitary Waste Systems

D2030 Misc. Details
D2031 Waste and Vent Piping Systems
D2032 Waste Piping Specialties
D2033 Waste Piping Equipment
D2034 Waste Piping Insulation
D2035 Acid Waste Systems

D204 Rain Water Drainage Systems

D2040 Misc. Details
D2041 Rain Water Drainage Piping Systems
D2042 Rain Water Drainage Specialties
D2043 Rain Water Drainage Insulation

D205 Special Plumbing Systems

D2050 Misc. Special Plumbing Details
D2051 Medical Gas Systems
D2052 Helium Gas Systems
D2053 Liquid Oxygen Systems
D2054 Vacuum Systems
D2055 Natural Gas Systems
D2056 Liquified Petroleum Gas Systems
D2057 Deionized/Distilled Water Systems
D2058 Reverse Osmosis Systems
D2059 Fountain Equipment and Piping

D206 Compressed Air Systems

D2060 Misc. Compressed Air Details
D2061 Compressed Air Piping and Equipment
D2062 Compressed Air Legends and Schematics

D30 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) SYSTEMS

D301 Fuel Supply Systems

D3010 Misc. Fuel Supply Details
D3011 Oil Supply Systems
D3012 Gas Supply Systems
D3013 Coal Supply Systems

D302 Heat Generation Systems

D3020 Misc. Heat Generation Details
D3021 Steam Boilers
D3022 Hot Water Boilers
D3023 Furnaces
D3024 Fuel-Fired Heaters
D3025 Auxiliary Equipment

D303 Heat Rejection Systems

D3030 Misc. Heat Rejection Details
D3031 Absorption Chillers
D3032 Centrifugal Chillers
D3033 Reciprocating Chillers
D3034 Rotary-Screw Chillers
D3035 Cooling Towers and Liquid Coolers
D3036 Refrigerant Compressors and Condensers
D3037 Heat Pumps

D304 Heat Distribution Systems

- D3040 Misc. Heat Distribution Details
- D3041 Air Distribution Systems
- D3042 Stream Distribution Systems
- D3043 Hydronic Distribution Systems
- D3044 Exhaust and Ventilation Systems

D305 Heat Transfer

- D3050 Misc. Heat Transfer Details
- D3051 Heat Exchangers
- D3052 Package Terminal Air Conditioning Systems (PTAC)
- D3053 Split Systems
- D3054 Air Coils
- D3055 Humidifiers
- D3056 Dehumidifiers
- D3057 Terminal Heat Transfer Units
- D3058 Energy Recovery Units

D306 HVAC Controls and Instrumentation

- D3060 Misc. HVAC Control Details
- D3061 Building Systems Control
- D3062 Energy Management and Conservation Systems
- D3063 HVAC Control Systems
- D3064 HVAC Sequence of Operation
- D3065 Gas Purging Systems

D307 HVAC System Testing, Adjusting, and Balancing

- D3070 Misc. Details
- D3071 Mechanical Systems Testing, Adjusting, and Balancing
- D3072 Piping Systems Testing, Adjusting, and Balancing
- D3073 Air Systems Testing, Adjusting, and Balancing

D308 Special HVAC Systems and Equipment

- D3080 Misc. Details
- D3081 Solar Energy Collection, Conversion, and Storage
- D3082 Industrial Ventilation

D40 FIRE PROTECTION SYSTEMS**D401 Fire Protection Sprinkler Systems**

- D4010 Misc. Sprinkler Details
- D4011 Wet Pipe Sprinkler Systems
- D4012 Dry Pipe Sprinkler Systems
- D4013 Pre-Action Sprinkler Systems
- D4014 Combination Dry Pipe and Pre-Action Sprinkler Systems
- D4015 Deluge Sprinkler Systems
- D4016 Fire Pumps

D402 Standpipe and Hose Systems

- D4020 Misc. Standpipe Details
- D4021 Fire Protection Standpipe
- D4022 Fire Protection Valves, Hoses, and Cabinets

D403 Fire Protection Specialties

- D4030 Misc. Specialty Details
- D4031 Fire Extinguishers, Cabinets, and Accessories
- D4032 Fire Blankets and Cabinets
- D4033 Wheeled Fire Extinguisher Units

D404 Special Fire Protection Systems

- D4040 Misc. Special System Details
- D4041 Foam Extinguishing Systems (AFFF)
- D4042 Carbon Dioxide Extinguishing Systems
- D4043 Halogen Agent Extinguishing Systems
- D4044 Dry Chemical Extinguishing Systems

D50 ELECTRICAL SYSTEMS**D501 Electrical Service and Distribution**

- D5010 Misc. Details
- D5011 Main Transformers
- D5012 Secondary Transformers
- D5013 Main Switchboards
 - D501301E.* - Motor Control Center (MCC) - Elevation
- D5014 Interior Distribution Transformers
- D5015 Branch Circuit Panelboards

D5016 Enclosed Circuit Breakers

D5017 Motor Control Centers

D5018 Aerial Distribution Details

- D501801E.* - Typical Three Phase Pole (0° - 9°)
- D501802E.* - Typical Three Phase Pole (10° - 30°)
- D501803S.* - (Omitted)
- D501804E.* - Double Dead End, Double Riser Pole
- D501805E.* - Primary Riser Pole
- D501806E.* - Alternate Dead-End Clamps
- D501807E.* - Riser Pole Detail
- D501808E.* - Typical Straight Thru with Three Phase Take-Off
- D501809E.* - Tangent Riser Pole (Front View)
- D501810E.* - (Omitted)
- D501811X.* - (Omitted)
- D501812E.* - Overhead Primary, Underground Secondary Transformer Pole
- D501813E.* - Vertical Three Phase Dead End Pole
- D501814E.* - Riser Pole Detail
- D501815E.* - Three Phase Line Pole

D5019 Underground Distribution Details

- D501901E.* - Transformer Pad Detail
- D501902E.* - Grounding Detail at the Pad Mounted Transformer
- D501903P.* - Electric Manhole Detail
- D501904X.* - Manhole Frame and Cover Details
- D501905E.* - (Omitted)
- D501906P.* - Combination Manhole
- D501907E.* - Manhole Accessories
- D501908X.* - Ductbank Window Detail
- D501909E.* - Neutral/Ground Connection in Manhole
- D501910P.* - Standard Electrical Manhole (Traffic) Types 3, 4, 5, and 6
- D501911P.* - Standard Electrical Handhole (Non-Traffic) Types 1 and 2
- D501912P.* - Standard Electrical Manhole (Non-Traffic) Types 1 and 2
- D501913E.* - Pulling-In Irons, Cable Racks, and Duct Entrance
- D501914E.* - Conversion from PVC to Steel Conduit

D502 Lighting and Branch Wiring

D5020 Misc. Lighting and Branch Wiring Details

- D502001S.* - (Omitted)
- D502002E.* - Fixture Type T
- D502003E.* - Retractable Receptacle Detail
- D502004E.* - Receptacle Detail

D5021 Electrical Branch Wiring

- D502101E.* - Typical Cable Tray

D5022 Interior Lighting

- D502201E.* - Fixture Type Y
- D502202E.* - Fixture Type M, ME
- D502203E.* - 18 Cell 2-Lamp Parabolic Troffer
- D502204E.* - Fixture Type R, S, and T
- D502205E.* - Canopy Light Detail
- D502206E.* - Fixture Type H, HE
- D502207E.* - Fixture Type C, CE
- D502208E.* - Fixture Type C
- D502209E.* - (Omitted)
- D502210E.* - Fixture Type H, CC
- D502211E.* - Fixture Type G
- D502212E.* - Explosion Proof Exit Fixture
- D502213E.* - Explosion Proof Emergency Light Fixture
- D502214E.* - Fixture Type P
- D502215E.* - Pit Light Detail
- D502216E.* - Wall Mounted Fluorescent Fixture
- D502217E.* - Beacon Wall Bracket, Flashing Beacon
- D502218E.* - Fixture Type K
- D502219E.* - Fixture Type W
- D502220E.* - Fixture Type T, TE
- D502221E.* - Wall Mounted Indirect Fluorescent w/Wood Shielding
- D502222E.* - Industrial Fluorescent
- D502223E.* - Surface Mounted Wrap-Around Luminaire for Other than Office Type Spaces
- D502224E.* - Surface Mounted Wrap-Around Luminaire for Office/Classroom Type Spaces
- D502225E.* - Surface, Pendant, or Bracket Mounted Parabolic Luminaire
- D502226E.* - Steel-Sided Surface Fluorescent
- D502227E.* - Round Surface Fluorescent
- D502228E.* - Surface Mounted 1-Lamp Nonbreakable Luminaire

D502229E.* - Decorative Specialty 1-Lamp Luminaire
 D502230E.* - Recess Mounted Commercial HID
 D502231E.* - Surface Mounted Commercial HID
 D502232E.* - High Bay Industrial HID
 D502233E.* - Low Bay Industrial HID
 D502234E.* - Indirect HID Luminaire
 D502235E.* - HID Wall Mounted Luminaire
 D502236E.* - Recessed Round HID
 D502237E.* - Handball and Racquetball Court Luminaire
 D502238E.* - Ceiling Mounted Vandal-Resistant Luminaire
 D502239E.* - Wall Mounted Vandal-Resistant Luminaire
 D502240E.* - Exit Sign
 D502241E.* - Explosion-Proof Luminaire
 D502242E.* - Emergency Lighting Unit
 D502243E.* - Lens Type Emergency Lighting Unit
 D502244E.* - Cylinder Type Emergency Lighting Unit
 D502245E.* - Troffer
 D502246E.* - 2 X 2 and 2 X 4 Parabolic Troffers
 D502247E.* - 1 X 4 Parabolic Troffer
 D502248E.* - Semi-Recessed Baffle Downlight (Incandescent)
 D502249E.* - Recessed Baffle Downlight (Incandescent)
 D502250E.* - Adjustable Semi-Recessed Spotlight
 D502251E.* - Remote Fixtures for Use with Battery Unit
 D502252E.* - Low Voltage Recessed Incandescent
 D502253E.* - Type L Fixture
 D502254E.* - Adjustable Incandescent Interior Spotlight
 D502255E.* - Wall Mounted Fluorescent Fixture

D5023 Exterior Lighting
 D502301E.* - Exterior HID Bollard Luminaire
 D502302E.* - Exterior Incandescent Luminaire
 D502303E.* - Mounting Detail Type C Fixture
 D502304E.* - Wall Mounted Vaportight Fixture

D502305E.* - Type ED - Obstruction Light Detail
 D502306E.* - Concrete Base Detail
 D502307E.* - Floodlight and Sports Light
 D502308E.* - Roadway and Area Light
 D502309E.* - Roadway and Area Light
 D502310E.* - Floodlight
 D502311E.* - Obstruction Light
 D502312E.* - Sports and Area Light
 D502313E.* - Fixture Support Detail
 D502314E.* - Lighting Pole Foundation Detail
 D502315E.* - Step Light

D503 Communication and Security Systems

D5030 Misc. System Details

D503001P.* - Bar Type Cable Tray
 D503002P.* - Channel Type Cable Tray
 D503003I.* - Trough Type Cable Tray
 D503004I.* - Slotted Channeling
 D503005I.* - Closed Channeling
 D503006I.* - Channel Splice
 D503007E.* - Single-Mode Fiber Optic
 D503008E.* - Multi-Mode Fiber Optic
 D503009E.* - Coaxial Cable RG-58/U
 D503010E.* - Shielded Telephone/Station Cable
 D503011E.* - Shielded Copper Twisted Pair
 D503012E.* - Unshielded Copper Twisted Pair
 D503013E.* - Fiber Optic Splice Housing
 D503014E.* - Aerial Splice Case
 D503015E.* - Stainless Steel Splice Case
 D503016E.* - Clear Plastic Splice Case
 D503017E.* - BNC Wall Plate Jack and Connector
 D503018E.* - Fiber Optic Wall Plate Jack and Connector
 D503019I.* - Single Sided Equipment Rack
 D503020I.* - Double Sided Equipment Rack
 D503021I.* - Relay Racks
 D503022E.* - Intermediate Distributing Frame
 D503023E.* - Universal Distributing Frame (Single Sided)
 D504024E.* - Universal Distributing Frame (Double Sided)
 D503025E.* - Universal Distributing Frame (Floor Wall)

D503026E.* - Wall Frame
 D503027E.* - Pre-wired 66 Block to Modular Jack
 D503028E.* - 66 Block
 D503029E.* - BNC Terminator
 D503030I.* - Telcom Standard Light Cabinet
 D503031I.* - Telcom Standard Heavy Cabinet
D5031 Alarm and Detection Systems
D5032 Clock and Programs Systems
D5033 Voice and Data Systems
 D503301E.* - Wire Fiber Outlet
 D503302E.* - Typical Modular Telephone Jack
 D503303I.* - Communication Closet
 D503304I.* - Main Cross Connect
 D503305I.* - Intermediate/Horizontal Cross Connect
 D503306E.* - RJ-11 Wall Plate Jack and Connector
 D503307E.* -RJ-45 Wall Plate Jack and Connector
 D503308E.* - Central Office Connector (100 Pair Cap.)
D5034 Public Address and Music Systems
D5035 Television Systems
 D503501E.* - Typical TV Outlet Jack
D5036 Underground Communications Details
 D503601E.* -Telephone Manhole
 D503602I.* - 38Y Precast Telephone Manholes
 D503603P.* - Poured in Place Communication Manhole
 D503604E.* - Communication Duct Entrance Detail
 D503605E.* - Exterior Telecomm Plant Enclosure
 D503606I.* -Exterior Telecomm Plant Enclosure
 D503607E.* - Typical Handhole
 D503608X.* - Typical Handhole Entry
 D503609E.* - Duct Spacers
 D503610E.* -Manhole Cable Racks
 D503611X.* - Typical Manhole
 D503612X.* - Ducts Encased in Concrete
 D503613X.* - Duct Entry into Building
 D503614E.* - Innerduct Installation in Duct

D504 Special Electrical Systems
D5040 Misc. Special System Details
D5041 Uninterruptible Power Supply Systems
D5042 Packaged Engine Generator Systems
D5043 Battery Power Systems
D5044 Cathodic Protection
D5045 Electromagnetic Shielding Systems
 D504501E.* - Secure Area Penetration
 D504502X.* - Welded Conduit Coupling
D5046 Lightning Protection Systems
 D504601E.* - Horizontal Roof Air Terminal Detail
 D504602E.* - Sloped Roof Air Terminal Detail
 D504603E.* - Air Terminal & Flat Surface Mounting Base Assembled
 D504604E.* - Air Terminal Detail
 D504605E.* - Air Terminal Detail
 D504606E.* - Air Terminal Detail
 D504607E.* - Typical Mounting of Terminals on Roof Ridge
 D504608E.* - Air Terminal Detail
 D504609E.* - Air Terminal Detail
 D504610E.* - Grounding Detail
D5047 Unit Power Conditioners
D5048 Grounding Details
 D504801E.* - Grounding Plate Detail
 D504802E.* - System Ground Detail
 D504803E.* - Typical Panel Grounding Detail
 D504804X.* - Column Grounding Detail
 D504805E.* - Bonding Plate Detail
 D504806X.* - Ground Rod Installation Detail
 D504807E.* - Ground Bar Detail
 D504808E.* - Static Grounding Receptacle Detail

D505 Electrical Controls
D5050 Misc. Control Details
D5051 Electrical Systems Controls
 D505101S.* - Control Diagram for Receptacle
D5052 Lighting Control Systems
 D505201E.* - Photoelectric Control Detail
D5053 Instrumentation

D506 Electrical Testing

D5060 Misc. Details

D5061 Electrical Systems Testing

D60 SPECIAL MECHANICAL SYSTEMS**D601 Fuels and Lubricants**

D6010 Misc. Fuels and Lubricant Details

D6011 Fuel Oil Systems

D6012 Fuel Dispensing and Vapor Recovery

D6013 Lubrication Oil Systems

D6014 Fuel Storage Tanks

D6015 Day Tanks

D602 Auxiliary/Emergency Power

D6020 Misc. Details

D6021 Generator Sets

D6022 Mufflers/Silencers

D603 Supports

D6030 Misc. Piping Supports

D6031 MSS Piping Supports

D6032 Seismic Supports

D6033 Fire Suppression Supports

D604 Valves

D6040 Misc. Valve Details

D605 Hydropower, Locks, and Dams

D6050 Misc. Civil Works

D6051 Hydropower Equipment

D6052 Locks and Dams

E EQUIPMENT AND FURNISHINGS**E10 EQUIPMENT****E101 Commercial Equipment**

E1010 Misc. Commercial Equipment

E1011 Security and Vault Equipment

E1012 Teller and Service Equipment

E1013 Registration Equipment

E1014 Checkroom Equipment

E1015 Mercantile Equipment

E1016 Commercial Laundry and Dry Cleaning Equipment

E1017 Vending Equipment

E1018 Office Equipment

E102 Institutional Equipment

E1020 Misc. Institutional Equipment

E1021 Ecclesiastical Equipment

E1022 Library Equipment

E1023 Theater and Stage Equipment

E1024 Instrumental Equipment

E1025 Audio-Visual Equipment

E1026 Detention Equipment

E1027 Laboratory Equipment

E1028 Medical Equipment

E1029 Mortuary Equipment

E103 Vehicular Equipment

E1031 Vehicular Service Equipment

E1032 Parking Control Equipment

E1033 Loading Dock Equipment

E104 Other Equipment

E1041 Maintenance Equipment

E1042 Solid Waste Handling Equipment

E1043 Food Service Equipment

E1044 Residential Equipment

E1045 Unit Kitchens

E1046 Darkroom Equipment

E1047 Athletic, Recreational, and Therapeutic Equipment

E1048 Planetarium/Observatory Equipment

E1049 Agricultural Equipment

E20 FURNISHINGS**E201 Fixed Furnishings**

E2010 Misc. Fixed Furnishings

E2011 Fixed Artwork

E2012 Fixed Casework

E2013 Window Treatment

E2014 Fixed Floor Grilles and Mats

E2015 Fixed Multiple Seating

E2016 Fixed Interior Landscaping

E202 Movable Furnishings

E2020 Misc. Movable Furnishings

E2021 Movable Artwork

E2022 Furniture and Accessories
 E2023 Movable Rugs and Mats
 E2024 Movable Multiple Seating
 E2025 Movable Interior Landscaping

F OTHER BUILDING CONSTRUCTION

F10 SPECIAL CONSTRUCTION

F101 Special Structures

F1010 Misc. Special Structures
 F1011 Air Supported Structures
 F1012 Pre-Engineered Structures

F102 Integrated Construction

F1020 Misc. Integrated Construction
 Details
 F1021 Integrated Assemblies
 F1022 Special Purposed Rooms

F103 Special Construction Systems

F1030 Misc. Special Construction System
 Details
 F1031 Sound, Vibration, and Seismic
 Construction
 F1032 Radiation Protection
 F1033 Special Security Systems

F104 Special Facilities

F1040 Misc. Special Facility Details
 F1041 Aquatic Facilities
 F1042 Ice Rinks
 F1043 Site Constructed Incinerators
 F1044 Kennels and Animal Shelters
 F1045 Liquid and Gas Storage Tanks

F105 Special Controls and Instrumentation

F1050 Misc. Special Controls and
 Instrumentation Details
 F1051 Recording Instrumentation
 F1052 Building Automation Systems
 F1053 Fire Suppression and Supervisory
 Systems

F20 SELECTIVE DEMOLITION

F201 Building Elements Demolition

F2011 Minor Demolition for Remodeling
 F2012 Selective Structural Demolition

F202 Hazardous Components Abatement

G BUILDING SITEWORK

G10 SITE PREPARATION

G101 Subsurface Investigation

G1011 Standard Penetration Tests
 G1012 Seismic Investigation

G102 Site Clearing

G1021 Sod Stripping
 G1022 Clearing and Grubbing
 G1023 Shrub and Tree Removal

G103 Site Demolition and Relocations

G1031 Building Demolition
 G1032 Site Elements Demolition
 G1033 Structure Relocation
 G1034 Utility Relocation

G104 Site Earthwork

G1041 Grading
 G1042 Excavating, Backfilling, and
 Compacting
 G1043 Soil Stabilization
 G1044 Slope Protection and Erosion
 Control
 G1045 Earth Dams

G105 Hazardous Waste Removal

G20 SITE IMPROVEMENTS

G201 Roadways

G2011 Roadway Base Courses
 G2012 Flexible Roadway Pavement
 G2013 Roadway Unit Pavers
 G2014 Rigid Roadway Paving
 G2015 Roadway Curb and Gutter
 G2016 Roadway Appurtenances

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G2021 Parking Lot Base Courses

G2022 Flexible Parking Lot Pavement
G2023 Parking Lot Unit Pavers
G2024 Rigid Parking Lot Paving
G2025 Parking Lot Curb and Gutter
G2026 Parking Lot Appurtenances

G203 Pedestrian Paving

G2031 Pedestrian Paving Base Courses
G2032 Flexible Pedestrian Pavement
G2033 Pedestrian Unit Pavers
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G30 SITE PLUMBING UTILITIES

**G301 Site Water Supply and Distribution
Systems**

G3011 Water Wells
G3012 Site Domestic Water Distribution
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Distribution Systems

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G302 Site Sanitary Sewer Systems

G3021 Site Sanitary Sewerage
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G3023 Site Sanitary Sewerage Equipment
G3024 Sewage Ponds

G303 Site Storm Sewer Systems

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G3034 Storm Water Ponds and Reservoirs

G304 Site Fuel Distribution Systems

G3041 Site Gas Distribution Systems
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G3051 Industrial Waste Systems
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Systems

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AND AIR CONDITIONING
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G4010 Misc. Site Steam Distribution
Systems
G4011 Site Steam Piping Systems
G4012 Site Steam Distribution Equipment

**G402 Site Hydronic Distribution
Systems**

G4021 Site Hydronic Piping Systems
G4022 Site Hydronic Distribution
Equipment

G50 SITE ELECTRICAL UTILITIES

G501 Site Electrical Distribution

G5011 Site Electrical Substations
G5012 Site Electric Power Distribution
Lines

G5013 Site Electric Power Transmission
Equipment

G502 Site Lighting Systems

G5021 Area Site Lighting Systems

G5022 Security Site Lighting Systems

G5023 Other Site Lighting Systems

**G503 Site Communication and Security
Systems**

G5030 Misc. Systems

G5031 Site Alarm and Detection Systems

G5032 Site Voice and Data Systems

G5033 Site Television Systems

G5034 Site TV Security Monitoring
Systems

G5035 Site Security Sensor Systems

G505 Other Site Electrical Systems

G5051 Cathodic Protection Systems

G60 OTHER SITE CONSTRUCTION

G601 Service Tunnels

**G602 Other Site Systems and
Equipment**

G6021 Contaminant Processing Systems
and Equipment

6 Inch-Pound Library

The following pages contain images of the CADD Details Library. The details presented are accessible through the Center-supplied retrieval programs. Loading instructions are provided as part of the electronic media. Appendix C contains a form for recommending changes to specific details within the CADD Details Library.

Note: Because these details represent existing details used within the DoD, it should be noted that the level/layer assignments, colors, and line weights for some details do not meet the prescribed standards set forth in this manual. Subsequent versions of the CADD Details Library will continue to convert details to meet the prescribed standards.

Appendix A

Abbreviations for CADD Details Library

Abbreviation	Definition	Abbreviation	Definition
(N)	new	AMB	ambient
(R)	relocated item	AMP	ampere
<	angle	ANC	anchor, anchorage
1/4 RD	quarter round	ANOD	anodized
A/C	air conditioning	ANSI	American National Standards Institute
A.C.	alternating current	AP	access panel
A.L.	active leaf	APPD	approved
AB	anchor bolt	APPROX	approximate
ABV	above	ARCH	architect(ural)
ACC	access	ARI	American Refrigeration Institute
ACI	American Concrete Institute	ASB	asbestos
ACPL	acoustical plaster	ASC	above suspended ceiling
ACR	acrylic plastic	ASPH	asphalt
ACSR	aluminum conductor steel reinforced	AT, ACT	acoustical (ceiling) tile
ACST	acoustic	ATC	acoustical tile ceiling
ACU	air conditioning unit	AUTO	automatic
AD	access door	AVG	average
ADD	addendum	AWC	acoustical wall covering
ADH	adhesive	AWG	American wire gauge
ADJ	adjacent, adjunct	B	bins
ADJT	adjustable	B.M.	bench mark
ADO	automatic door operator	BATT INSUL	batt insulation
AFF	above finished floor	BBD	bulletin board
AGG	aggregate	BC	bookcase
AHU	air handling unit	BD	board
AI	area inlet	BDY	boundary
AIC	amps interrupting capacity (sym rms)	BE	bench
AISC	American Institute of Steel Construction	BEJ	brick expansion joint
ALT	alternate	BEL	below
ALUM	aluminum	BIT	bituminous

Abbreviation	Definition	Abbreviation	Definition
BJT	bed joint	CHAM	chamfer
BL	building line	CHBD	chalkboard
BLDG	building	CHIM	chimney
BLK	block	CHT	ceiling height
BLKG	blocking	CI	cast iron
BM	beam	CIPC	cast-in-place concrete
BO	bottom of	CIR	circular
BOT	bottom	CIRC	circumference
BP	back plaster(ed)	CJT	control joint
BPL	bearing plate	CKD	checked
BPR	bed pan and urinal rack	CKT	circuit
BRCG	bracing	CL WG	clear wire glass
BRDG	bridging	CL	center line
BRG	bearing	CLG	ceiling
BRK	brick	CLGL	clear glass
BRKT	bracket	CLKG	caulking
BRZ	bronze	CLL	contract limit line
BS	both sides	CLO	closet
BSMT	basement	CLOS	closed
BT	bent	CLR	clear(ance)
BTU	British thermal unit	CLS	closure
BTUH	btu per hour	CM	centimeter(s)
BTW	between	CMP	corrugated metal pipe
BUR	built-up roofing	CMT	ceramic mosaic (tile)
BVL	beveled	CMU	concrete masonry unit
BW	both ways	CND	conduit (for raceway-elec. sheets)
C to C	center to center	CNL	conductive neoprene latex
C.B.	circuit breaker	CNTR	counter
C.I.	curb inlet	CO	cleanout
C.T.	current transformer	CO2	carbon dioxide
CAB	cabinet	COL	column
CAD	cadmium	COM	common
CAP	capacity	COMB	combustion
CB	catch basin	COMP	compress(ed)(ion)(ible)
CCT	cubicle curtain track	COMPO	composite, composition
CCU	coronary care unit	COMPT	compartment
CE	cover elevation	CONC	concrete
CEM	cement	CONN	connection
CER	ceramic	CONST	construction
CFI	conductive flooring	CONST JT	construction joint
CFL	counterflashing	CONT	continue (ous)
CFM	cubic feet per minute	CONTR	contract(or)
CFT	cubic foot	COR	corner
CG	corner guard		

Abbreviation	Definition	Abbreviation	Definition
CORR	corrugated	DH	duct heater
CORR.	corridor	DIA	diameter
COV	covered	DIAG	diagonal
CP, CPT	carpet(ed)	DIM	dimension
CPL	cement plaster	DISC	disconnect
CPR	copper	DISP	dispenser
CPS	cycles per second (hertz)	DIST	distribution
CR	chromium (plated)	DIV	division
CRES	corrosive resistant steel	DL	dead load
CRG	cross grain	DMT	demountable
CRS	course(s)	DN	down
CSK	countersink, countersunk	DP	dampproofing
CSMT	casement	DPR	damper
CST	cast stone	DR	door
CT	ceramic tile	DRB	drainboard
CTL	carpet tile	DRN	drain
CTP	ceramic tile panel	DS	downspout
CTR	center	DSB	double strength "b" quality glass
CTSK	countersunk screw	DT	drain tile
CU	condensing unit	DTA	dovetail anchor
CU YD	cubic yards	DTL, DET	detail
CUH	cabinet unit heater	DTS	dovetail anchor slot
CV	ceiling vent	DW	dumbwaiter
CVH	conductive vinyl homogeneous (sheet type)	DWG	drawing
CW	cold water	DWGS	drawings
CYL	cylinder	DWLS	dowels
d	penny (as in nail - 10d)	DWR	drawer
D	datum	DX	direct expansion
D.H.	double hung	E	east
D&M	dressed and matched	E.P.	electric panelboard
DA	double acting	EA	exhaust air
DB	dry bulb	EA.	each
DBL	double	EAT	entering air temperature
DC	dental casework	EB	expansion bolt
DCJ	doweled control joint	EEG	electro encephalographic
DCJT	dummy control joint	EF	each face
DCL	door closer	EJ	expansion joint
DEG	degree	EKG	electrocardiograph
DEM	demolish	EL, ELEV	elevation - grade or building
DEP	depressed	ELEC	electric or electrical
DEPR	depression	EMD	estimated maximum demand
DEPT	department	EMER	emergency
DF	drinking fountain	ENCL	enclose(ure)

Abbreviation	Definition	Abbreviation	Definition
ENT	ear, nose, and throat	FH	flathead or flushhead
ENTR	entrance, entering	FHC	fire hose cabinet
EP	explosion proof	FHMS	flathead machine screw
EPY	epoxy coating	FHR	fire hose rack
EQ	equal	FHS	fire hose station
EQUIP	equipment	FHWS	flathead wood screw
ESC	escalator	FI	film illuminator
EST	estimate(d)	FIG	figure
EWC	electric water cooler	FIN	finish(ed)
EWT	entering water temperature	FIX	fixture
EXCA	excavate	FJT	flush joint
EXD	exit device	FL	floor
EXH	exhaust	FLASH	flashing
EXIST	existing	FLCO	floor cleanout
EXMP	expanded metal plate	FLEX	flexible
EXP	exposed, expansion	FLG	flooring
EXPL	explosion	FLR	floor
EXPN	expansion	FLUOR	fluorescent
EXS	extra strong	FN	fence
EXT	exterior	FOC	face of concrete
F	Fahrenheit	FOF	face of finish
F.D.	fire damper	FOM	face of masonry
F.H.	fire hydrant	FOS	face of studs
FA	fire alarm	FP	fire partition
FAC	fire apparatus closet	FPL	floor plate
FAI	fresh air intake	FPM	feet per minute
FAS	fasten(er)	FPRF	fireproof
FB	face brick	FR	frame(d)(ing)
FBD	fiberboard	FRA	fresh air
FBO	furnished by others	FRC	fire-resistant coating
FBRK	fire brick	FRG	forged
FC	foot-candle	FRT	fire-retardant
FCG	facing	FS	full size
FCJ	floor construction joint	FT	feet
FCU	fan coil unit	FTG	footing
FD	floor drain	FUR	furr(ed)(ing)
FDN	foundation	FUT	future
FE	fire extinguisher	FW	fire water
FEB	fire extinguisher bracket	FWC	fabric wall covering
FEC	fire extinguisher cabinet	G	gas
FF	factory finish	GA	gage or gauge
FFE	finished floor elevation	GAL	gallon(s)
FFL	finished floor line	GALV	galvanized
FGL, F.G.	fiberglass	GB	grab bar

Abbreviation	Definition	Abbreviation	Definition
GC	general contract(or)	HDR	header
GCMU	glazed concrete masonry units	HDRL	handrail
GCO	ground cleanout	HDW	hardware
GEN	general	HES	high early-strength cement
GF	ground face	HH	handhole
GFE	government-furnished equipment	HIP	high pressure
GFE/CI	government-furnished equipment contractor installed	HJT	head joint
GFI	ground fault interrupter	HK	hook(s)
GI	galvanized iron	HOR	horizontal
GKT	gasket(ed)	HP	horsepower
GL	glass, glazing	HPT	high point
GLB	glass block	HR	hour
GLF	glass fiber	HS	high strength
GND	ground	HSGYP	high-strength gypsum plaster
GOVT	government	HT	height
GP	galvanized pipe	HTG	heating
GPDW	gypsum drywall	HTR	heater
GPL	gypsum lath	HVAC	heating, ventilating and air conditioning
GPM	gallons per minute	HWD	hardwood
GPPL	gypsum plaster, finish floor	HWH	hot water heater
GPT	gypsum tile	HX	hexagonal
GR	grade(ing)	HYD	hydraulic
GRN	granite	HZ	hertz
GRS	galvanized rigid steel conduit	I	iron
GRTG	grating	I.D.	inside diameter
GSS	galvanized steel sheet	IC	intercom
GST	glazed structural tile	ICU	intensive care unit
GSU	glazed structural units	IES	illuminating engineering society
GT	grout	ILK	interlock
GVL	gravel	IN	inch
GWB	gypsum wallboard	INCIN	incinerator
GWT	glazed wall tile	INCL	include(d)(ing)
GYP	gypsum	INSC	insulating concrete
H.D.	heavy duty	INSF	insulating fill
H.M.	hollow metal	INSUL	insulation
H'CAP	handicapped	INSUL'D	insulated
HAC	housekeeping aide's closet	INT	interior
HB	hose bibb	INTM	intermediate
HBD	hardboard	INV	invert(ed)
HC	hollow core	IP	iron pipe
HCD	halon containment damper	IPS	iron pipe size
HD	head	I.P.S.	inside pipe size

Abbreviation	Definition	Abbreviation	Definition
IV	intravenous	LPS	lightproof shade
JB	junction box	LPT	low point
JC	janitor's closet	LR	living room
JCT	junction	LT WT	lightweight
JF	joint filler	LT	light
JST	joist	LTG	lighting
JT	joint	LVR	louver
KCM	kilo circular mil	LWC	lightweight concrete
KCPL	Keene's cement plaster	LWT	leaving water temperature
KIP	kilopound (1000 pounds)	M	meter(s)
KIT	kitchen	M&B	matched and beaded
KL	key lock	MACH	machine
KO	knockout	MAS	masonry
KPL	kickplate	MAX	maximum
KV	kilovolts	MB	machine bolts
KVA	kilovolt amperes	MBR	member
KVAR	kilovolt amperes reactive	MCJ	masonry control joint
KW	kilowatt	MCO	metal-cased opening
L	lumen	MDS	metal divider strip
L.H.	left hand(ed)	MECH	mechanic(al)
LAB	laboratory	MED	medium
LAD	ladder	MEDCAB	medical cabinet
LAM	laminate(d)	MER	mechanical equipment room
LAT	leaving air temperature	MES	metal edge strip
LAU	laundry	MET	metal
LAV	lavatory	MFD	metal floor decking
LB	lag bolt	MFG	manufacturing
LBL	label	MFR	manufacture(er)
LBR	lumber	MGT	matte-glazed tile
LBS	pounds	MG	motor generator
LC	light control	MH	manhole
LD	load	MI	malleable iron
LDG	loading	MIN	minimum
LG	length	MIR	mirror
LIN	linear	MISC	miscellaneous
LIS	lawn irrigation system	ML	metal lath
LKR	locker	MLDG	moulding
LL	live load	MM	millimeter(s)
LLD	lead-lined door	MMB	membrane
LMS	limestone	MNIC	material not in contract (installation by contractor)
LNTL	lintel	MO	masonry opening
LONG	longitudinal	MOD	modular
LP	lightproof	MOD.	modified
LPD	lightproof door		

Abbreviation	Definition	Abbreviation	Definition
MONO	monolithic	OHMS	ovalhead machine screw
MOT	motor	OHWS	ovalhead wood screw
MOV	movable	OJ	open-web joist
MP	movable partition	OP	opaque
MR	mop receptor	OPH	opposite hand
MRB	marble	OPNG	opening
MRD	metal roof decking	OPP	opposite
MS	machine screws	OPS	operations
MSTC	mastic	OR	observation riser
MTD	mount(ed)(ing)	OS & Y	outside screw and yoke
MTFR	metal furring	OT	occupational therapy
MTHR	metal threshold	OW	observation window
MTL	material(s)	P	pole
MULL	mullion	P.L.	property line
MWK	millwork	P.S.	pressed steel
N	north	PA	public address
N.C.	normally closed	PAR	parallel
N.L.	neoprene latex	PART'N(S)	partition(s)
N.O.	normally open	PB	panic bar
N'REQD	not required	PBD	particle board
NAT	natural	PBPU	patient's bedside power unit
NEC	national electrical code	PBS	push button station
NEMA	National Electrical Manufacturer's Association	PC	piece
NFPA	National Fire Protection Association	PCC	precast concrete
NI	nickel	PCF	pounds per cubic foot
NIC	not in contract	PCPL	cement plaster (portland)
NL	nailable	PD	pavement drain
NMT	nonmetallic	PE	porcelain enamel
NO.	number	PED	pedestal
NOM	nominal	PERF	perforate(d)
NP	neuropsychiatric	PERI	perimeter
NR	noise reduction	PFL	pounds per lineal foot
NRC	noise reduction coefficient	PG	plate glass
N.T.S.	not to scale	PH	phase
O.D.	outside diameter	PHAR	pharmacy
OA	outside air	PI	point of intersection
OB WG	obscure wire glass	PIPU	prefab isolation power unit
OBGL	obscure glass	PIV	post indicating valve
OBSC	obscure	PK	parking
OC	on center(s)	PL	plate
OCEW	on center each way	PLAS	plaster
OFF	office	PLAS LAM	plastic laminate
OH	overhead	PLATF	platform
		PLBG	plumbing

Abbreviation	Definition	Abbreviation	Definition
PLG	piling	RCP	reinforced concrete pipe
PLYWD	plywood	RCVR	receiver
PNL	panel	RDGE	ridge
PNT	paint(ed)	RECEP	receptacle
POL	polish	RECR	recreation
PORC	porcelain	RECT	rectifier
PORT	portable	REF	reference
PPG	polished plate glass	REFR	refrigerator
PPM	parts per million	REG	reglet
PR	pair	REG.	register
PREFAB	prefabricate(d)	REINF	reinforcing, reinforced, reinforcement
PREFIN	prefinished	REM	remove(able)
PRF	preformed	REQ'D, REQD	required
PROJ	project	RESIL	resilient
PRV	pressure-regulating valve	RET	return
PS	pipe space	REV	revision(s), revised
PSC	prestressed concrete	RFG	roofing
PSF	pounds per square foot	RFH	roof hatch
PSI	pounds per square inch	RFL	reflect(ed)(ive)(or)
PT	pneumatic tube	RGE	range
PT.	point	RGH	rough
PTC	post-tensioned concrete	RH	relative humidity
PTD	paper towel dispenser	RK	rack
PTR	paper towel receptor	RL	rail(ing)
PV	pave(d)(ing)	RM	room
PVC	polyvinylchloride	RND	round
PVMT	pavement	RO	rough opening
PW	pass window	ROW	right of way
QT	quarry tile	RP	retractable partition
QT.	quart	RPM	revolutions per minute
QTRS	quarters	RPRT	raised pattern rubber tile
QTY	quantity	RSR	riser
R.D.	roof drain	RT	rubber tile
R.H.	right hand(ed)	RUB	rubber
R&S	casework in clergy room and sacristy, chaplain service	RVS	reverse (side)
RA	return air	RVT	rivet
RAD	radius	RWC	rainwater conductor
RAG	return air grille	S	south
RAR	return air register	S.B.	security bars
RB	rubber base, resilient base	S.C.	special coating
RBL	rubble stone	S&R	shelf and rod
RBT	rabbet, rebate	SA	supply air
RC	remote control	SB	splash block

Abbreviation	Definition	Abbreviation	Definition
SC	solid core	STD	standard
SCHED	schedule	STG	seating
SCI	spinal cord injury	STGR	stringer
SCN	screen	STL	steel
SCR	screw	STN	stone
SCT	structural clay tile	STOR	storage
SCUT	scuttle	STRL	structural
SD	storm drain	STWY	stairway
SDI	Steel Door Institute	SUB FL	subfloor
SECT	section	SUSP	suspended
SECY	secretary	SVF	sheet vinyl flooring
SEQ	sequence	SW	switch
SFGL	safety glass	SWBD	switchboard
SFTU	structural facing tile unit	SYM	symmetrical
SFU	structural facing unit	SYN	synthetic
SG	sheet glass	SYS	system
SH	shelf, shelving	T	tread
SHLD	shoulder	T' STAT	thermostat
SHO	shore(d)(ing)	T&G	tongue and groove
SHT	sheet	TA	table
SHTG	sheathing	TAN	tangent
SIM	similar	TB	towel bar
SJI	Steel Joist Institute	TC	terra cotta
SKL	skylight	TEL	telephone
SL	sleeve	TEMP	temperature
SM	sheet metal	TEMP.	temporary
SMS	sheet metal screws	TERM	terminal
SNT	sealant	TERR	terrazzo
SOV	shut off valve	TGL	toggle
SP	static pressure	TH	truss head
SPC	spacer	THK	thick(ness)
SPD	soundproof door	THR	threshold
SPEC(S)	specification(s)	TKBD	tackboard
SPF	soundproof	TKS	tackstrip
SPH	space heater	TO	top of
SPKR	speaker	TOIL	toilet
SPL	special	TOL	tolerance
SQ	square	TOPO	topography
SQHD	square head	TPD	toilet paper dispenser
SQUAD	squadron	TPTN	toilet partition
SS, SST	stainless steel	TR	transom
SSK	service sink	TRANS	transverse
SSMR	standing seam metal roofing	TSL	top of slab
STA	station	TST	top of steel

Abbreviation	Definition	Abbreviation	Definition
TT	terrazzo tile resinous matrix	VTR	vent thru roof
TV	television	VWC	vinyl wall covering
TW	top of wall	W	west
TYP	typical	W/	with
UC	unit cooler	W/O	without
UG	underground	W/C	wheelchair
UH	unit heater	W.D.	waste drain
UL	Underwriters Laboratories	W.S.	waste stack
UNEX	unexcavated	WB	wet bulb
UNFIN	unfinished	WC	water closet
UPS	uninterruptable power system	WCO	wood-cased opening
UR	urinal	WD BLK	wood blocking
UT	utility	WD	wood
UV	unit ventilator	WD DR	wood door
V	volt	WF	wire flange
V.T.	voltage transformer	WG	wire glass
VA	vinyl asbestos	WH	wall hung
VAB	vapor barrier	WHB	wheel bumper
VAR	varnish	WHM	watthour meter
VAT	vinyl asbestos tile	WHT	white
VB	vinyl base	WI	wrought iron
VCP	vitrified clay pipe	WIN	window
VCT	vinyl composition tile	WKSH	work shop
VD	vault door	WM	wire mesh
VENT	ventilator(ion)	WP	weatherproof
VERT	vertical	WPF, WPG	water proof(ing)
VEST	vestibule	WPT	working point
VF	vinyl fabric	WR	waste receptacle
VG	vertical grain	WRB	wardrobe
VH	vinyl homogeneous	WS	waterstop
VIN	vinyl	WSCT	wainscot
VJ	v-joint(ed)	WT	weight
VL	clinical laboratory equipment	WTH	width
VNR	veneer	WTW	wall to wall
VOL	volume	WWF	welded wire fabric
VR	radio isotope lab equipment	WWM	woven wire mesh
VRM	vermiculite	X	X-ray equipment radiology
VS	vent stack	XFMR	transformer
VT	vinyl tile	Y.D.	yard drain
		YD	yard

Appendix B

Metric Construction Information

The following information was originally published in the Construction Metrication Council's *Metric in Construction* newsletter, Volume 3, Issue 3, dated May-June 1994. *Metric in Construction* is a bimonthly newsletter designed to inform the building community about metrication in U.S. construction. The Construction Metrication Council was created by the National Institute of Building Sciences to provide industry-wide, public, and private sector support for the metrication of Federal construction and to promote the adoption and use of the metric system of measurement as a means of increasing the international competitiveness, productivity, and quality of the U.S. construction industry. The current Chairman of the Council is Mr. Thomas R. Rutherford, P.E., DoD, and the Executive Director is Mr. William A. Brenner, AIA. The Center would like to thank Mr. Brenner for allowing the reprint of the Council's newsletter information. For information on how to subscribe to *Metric in Construction*, please address all inquiries to the following:

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ONE MORE TIME: WHAT WILL CHANGE AND WHAT WILL STAY THE SAME?

METRIC MODULE AND GRID

What will change

- The basic building module, from 4 inches to **100 mm**.
- The planning grid, from 2' x 2' to **600 x 600 mm**.

What will stay the same

- A module and grid based on rounded, easy-to-use dimensions.

DRAWINGS

What will change

- Units, from feet and inches to millimeters for all building dimensions and to meters for large site plans and civil engineering drawings. Unit notations are unnecessary: if there's no decimal point, it's millimeters; if there's a decimal point carried to one, two, or three places, it's meters. Centimeters are not used in construction.

- Drawing scales, from inch-fractions-to-feet to true ratios. Preferred metric scales are **1:1** (full size); **1:5** (close to 3" = 1'-0"); **1:10** (between 1" = 1'-0" and 1-1/2" = 1'-0"); **1:20** (between 1/2" = 1'-0" and 3/4" = 1'-0"); **1:50** (close to 1/4" = 1'-0"); **1:100** (close to 1/8" = 1'-0"); **1:200** (close to 1/16" = 1'-0"); **1:500** (close to 1" = 40'-0"); **1:1000** (close to 1" = 80'-0").
- Drawing sizes, to the ISO "A" series: **A0 (1189 x 841 mm, 46.8 x 33.1 inches)**; **A1 (841 x 594 mm, 33.1 x 23.4 inches)**; **A2 (594 x 420 mm, 23.4 x 16.5 inches)**; **A3 (420 x 297 mm, 16.5 x 11.7 inches)**; **A4 (297 x 210 mm, 11.7 x 8.3 inches)**. Of course, metric drawings can be made on any size paper.

What will stay the same

- Drawing contents.

Never use dual units (both inch-pound and metric) on drawings. It increases dimensioning time, doubles the chance for errors, makes drawings more confusing, and delays the learning process.

SPECIFICATIONS

What will change

- Units of measure, from feet and inches to **millimeters** for linear dimensions, from square feet to **square meters** for area, from cubic yards to **cubic meters** for volume (except use **liters** for fluid volumes), and from other inch-pound units to metric units as appropriate.

What will stay the same

- Everything else in the specification.

Do not use dual units in specifications except when the use of an inch-pound measure serves to clarify an otherwise unfamiliar metric measure; then place the inch-pound unit in parentheses after the metric. For example, "7460 W (10 horsepower)." All unit conversions should be **checked by a professional** to ensure that rounding does not exceed allowable tolerances.

FLOOR LOADS

What will change

- Floor load designations, from "psf" to kilograms per square meter (**kg/m²**) for everyday use and kilonewtons per square meter (**kN/m²**) for structural calculations.

What will stay the same

- Floor load requirements.

Kilograms per square meter often are used to designate floor loads because many live and dead loads (furniture, filing cabinets, construction materials, etc.) are measured in kilograms. However, kilonewtons per square meter or their equivalent, megapascals, are the proper measure and should be used in structural calculations.

CONSTRUCTION PRODUCTS

What will change

- Modular products: brick, block, dry-wall, plywood, suspended ceiling components, and raised floors. They will undergo "hard" conversion; that is, their dimensions will change to new rounded "hard" metric numbers to fit the universal **600 x 600 mm** metric planning grid.
- A number of other products, such as concrete reinforcing bars and various

kinds of fasteners. They are being converted to hard metric sizes as the result of industry initiatives.

- Products that are custom fabricated for each job (for example, cabinets, stairs, handrails, ductwork, commercial doors and windows, structural steel, and precast concrete) or poured-in-place (concrete). Such products usually can be made to any size, inch-pound or metric, with equal ease so for metric jobs they simply will be fabricated or formed in metric.

What will stay the same

- The balance of products, since they are cut-to-fit at the jobsite (for example, framing lumber, woodwork, wiring, piping, and roofing) or are not dimensionally sensitive (for example, fasteners, hardware, electrical components, plumbing fixtures, HVAC equipment, and gravel). Such products will be just “soft” converted—that is, relabeled in metric. A 2-3/4" x 4-1/2" wall switch face plate will be relabeled 70 x 115 mm and a 30 gallon tank, 114 L. Eventually manufacturers may convert many of these products to new rounded “hard” metric sizes, but only when it becomes convenient to do so.

“2-BY-4” STUDS AND OTHER “2-BY” FRAMING (BOTH WOOD AND METAL)

What will change

- Spacing, from 16" to **400 mm**, and 24" to **600 mm**.

What will stay the same

- Cross sections.

“2-bys” are produced in fractional inch dimensions now so there is no need to convert them to new rounded “hard” metric dimensions. 2-by-4s may keep their traditional name or perhaps they’ll be relabeled a nominal 50 x 100 mm or a more exact size, such as 38 x 89 mm.

DRYWALL, PLYWOOD, AND OTHER SHEET GOODS

What will change

- Widths, from 4’-0" to **1200 mm**.
- Heights, from 8’-0" to **2400 mm**, 10’-0" to **3000 mm**.

What will stay the same

- Thicknesses, so fire, acoustic, and thermal ratings won’t have to be recalculated.

Metric drywall and plywood are readily available, but with a possible cost penalty for small orders. Metric rigid insulation may not be available at this time.

BATT INSULATION

What will change

- Nominal width labels, from 16" to **16"/400 mm** and 25" to **24"/600 mm**.

What will stay the same

- Everything else.

Batts will not change in width; they’ll just have a tighter “friction fit” when installed among metric-spaced framing members.

DOORS

What will change

- Height, from 6'-8" to **2050 mm** or **2100 mm** and from 7'-0" to **2100 mm**.
- Width, from 2'-6" to **750 mm**, from 2'-8" to **800 mm**, from 2'-10' to **850 mm**, from 3'-0" to **900 mm** or **950 mm**, and from 3'-4" to **1000 mm**.

What will stay the same

- Door thicknesses.
- Door materials and hardware.

For commercial work, doors can be ordered in any size since they normally are custom-fabricated.

CEILING SYSTEMS

What will change

- Grids and lay-in ceiling tile, air diffusers, and lighting fixtures— from 2' x 2' to **600 x 600 mm** and from 2' x 4' to **600 x 1200 mm**.

What will stay the same

- Grid profiles, tile thicknesses, air diffuser capacities, fluorescent tubes, and means of suspension.

RAISED FLOOR SYSTEMS

What will change

- Grids and lay-in floor tile, from 2' x 2' to **600 x 600 mm**.

What will stay the same

- Grid profiles, tile thicknesses, and means of support.

HVAC CONTROLS

What will change

- Temperature units, from Fahrenheit to Celsius.

What will stay the same

- All other parts of the controls.

Controls are now digital so temperature conversions can be made with no difficulty.

BRICK

What will change

- Standard brick to **90 x 57 x 190 mm**.
- Mortar joints from 3/8" and 1/2" to **10 mm**.
- Brick module from 2' x 2' to **600 x 600 mm**.

What will stay the same

- Brick and mortar composition.

Of the 100 or so brick sizes currently made, 5 to 10 are within a millimeter of a metric brick so the brick industry will have no trouble supplying metric brick.

CONCRETE BLOCK

What will change

- Block sizes to **190 x 190 x 390 mm**.

- Mortar joints from 1/2" to **10 mm**.
- Block module from 2' x 2' to **600 x 600 mm**.

What will stay the same

- Block and mortar composition.

SHEET METAL

What will change

- Designation from “gage” to millimeters.

What will stay the same

- Thickness, which will be soft converted to hundredths of a millimeter.

In specifications, use millimeters only or millimeters with the gage in parentheses.

CONCRETE

What will change

- Strength designations from “psi” to megapascals, rounded to the nearest 5 megapascals per ACI 318M, such as: 2500 psi to **20 Mpa**; 3000 psi to **25 Mpa**; 3500 psi to **25 Mpa**; 4000 psi to **30 Mpa**; 4500 psi to **35 Mpa**; 5000 psi to **35 Mpa**. The amount of rounding will depend upon the use of the concrete.

What will stay the same

- Everything else.

REBAR [revised 10/95]

What will change

- Rebars will probably remain the same size but be given new metric designations as follows: #3 to #10M, #4 to #13M, #5 to #16M, #6 to #19M, #7 to #22M, #8 to #25M, #9 to #29M, #10 to #32M, #11 to #36M, #14 to #45M, and #18 to #57M. Call the Concrete Reinforcing Steel Institute for details: 708-517-1200.

What will stay the same

- Concrete.

GLASS

What will change

- Cut sheet dimensions from feet and inches to millimeters.

What will stay the same

- Sheet thickness, which can be rolled to any dimension and is often rolled in millimeters now. See ASTM C1036.

PIPE

What will change

- Nominal pipe and tubing designations from inches to millimeters.

What will stay the same

- Pipe cross sections.

Pipes and fittings are produced in decimal inch dimensions but named in rounded inch dimensions as a matter of convenience. A 2-inch pipe has neither an inside nor an outside diameter of 2 inches, a 1-inch fitting has

no exact 1-inch dimension, and a 1/2-inch sprinkler head contains no 1/2-inch dimension anywhere, so there is no need to “hard” convert pipes and fittings to rounded metric dimensions. Instead, they will not change size but simply be renamed in metric as follows: 1/8" = **6 mm**; 3/16" = **7 mm**; 1/4" = **8 mm**; 3/8" = **10 mm**; 1/2" = **15 mm**; 5/8" = **18 mm**; 3/4" = **20 mm**; 1" = **25 mm**; 1-1/4" = **32 mm**; 1-1/2" = **40 mm**; 2" = **50 mm**; 2-1/2" = **65 mm**; 3" = **80 mm**; 3-1/2" = **90 mm**; 4" = **100 mm**; 4-1/2" = **115 mm**; and 1" = 25 mm for all larger sizes. See the July-August 1993 *Metric in Construction* newsletter for more information.

ELECTRICAL CONDUIT

What will change

- Nominal conduit designations from inches to millimeters.

What will stay the same

- Conduit cross sections.

Electrical conduit is similar to piping: it is produced in “soft” decimal inch dimensions but identified in nominal inch sizes. Neither nonmetallic nor metallic conduit will change size; they be relabeled in metric as follows: 1/2" = **16 (mm)**, 3/4" = **21**; 1" = **27**; 1-1/4" = **35**; 1-1/2" = **41**; 2" = **53**; 2-1/2" = **63**; 3" = **78**; 3-1/2" = **91**; 4" = **103**; 5" = **129**; 6" = **155**. These new metric names have been assigned by the National Electrical Manufacturers Association.

ELECTRICAL WIRE

What will change

- Nothing at this time.

What will stay the same

- Existing American Wire Gage (AWG) sizes.

STRUCTURAL STEEL

What will change

- Section designations, from inches to millimeters and from pounds per foot to kilograms per meter, in accordance with ASTM A6M.
- Bolts, to metric diameters and threads per ASTM A325M and A490M.

What will stay the same

- Cross sections.

Like pipe and conduit, steel sections are produced in decimal inch dimensions (with depths varying by weight) but are named in rounded inch dimensions. Metric names for equivalent sections are converted and rounded to the nearest 10 mm. Thus, a 10-inch section is relabeled as a 250 mm section and a 24-inch section is relabeled as a 610 mm section.

Appendix C

Detail Revision/Deletion Recommendation Form

Name: _____

Code: _____

Address: _____

Phone: _____

e-mail: _____

Detail Name: _____

Recommendation (Check one): Revise _____ Delete _____

Reason: _____

Please attach additional pages if more space is required.

Mail to: U.S. Army Engineer Research and Development Center
 Waterways Experiment Station
 Tri-Service CADD/GIS Technology Center
 CEWES-ID-C/Spangler
 3909 Halls Ferry Road
 Vicksburg, MS 39180-6199

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE June 1999		3. REPORT TYPE AND DATES COVERED Report 3 of a series
4. TITLE AND SUBTITLE CADD Details Library; Report 3, Electrical Details			5. FUNDING NUMBERS	
6. AUTHOR(S) Tri-Service CADD/GIS Technology Center				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Engineer Research and Development Center Waterways Experiment Station 3909 Halls Ferry Road, Vicksburg, MS 39180-6199			8. PERFORMING ORGANIZATION REPORT NUMBER Technical Report CADD-93-1	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) <p>Several years ago, before computer-aided design and drafting (CADD) became the standard drafting tool in design, a seasoned draftsman might require, on the average, 40 hr to develop a sheet of construction details. By using CADD, this effort has easily been reduced to less than 15 hr. By employing the proposed CADD Details Library, an entire sheet of 20 details can be constructed in less than 10 min and, in many cases, require only minor project-specific modifications. By any measure, the development and reuse of CADD details represent a considerable time-saving tool.</p> <p>It is important to realize that the CADD Details Library was developed by collecting existing details within the Department of Defense (DoD). The former Architectural Automation Task Group (AATG), now renamed the Architectural Automation Field Working Group (AAFWG), did not expend design funds to hire an architect/engineer or use in-house resources to develop completely new details. The AATG membership simply organized existing details into a generic format and cataloged them by type.</p> <p style="text-align: right;">(Continued)</p>				
14. SUBJECT TERMS CADD CADD Details Construction Details			15. NUMBER OF PAGES 178	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED		19. SECURITY CLASSIFICATION OF ABSTRACT
20. LIMITATION OF ABSTRACT				

13. (Concluded).

To further simplify the use of the details library, the AAFWG tasked the Tri-Service CADD/GIS Technology Center (the Center) to develop an icon-driven software retrieval system. Developed with MDL and AutoLISP programming, the retrieval software will work on UNIX and DOS Intergraph platforms and AutoCAD DOS systems.

Typically, detailing on a design project does not begin prior to the 35-percent design phase. At the 35-percent phase, the designer has defined the building's structure and envelope requirements and is ready to begin selecting typical project details.

After reviewing the generic details in hardcopy format and identifying usable details, the designer/draftsman initiates the CADD Detail Manager program. The designer scrolls through the details listing, identifies the desired detail, reviews it within the display icon, and then places it on the details sheet. The retrieval program provides a rectangular box (representing the detail's dimensions) that may be dragged within the drawing file and placed by snapping to any of the grid intersection points on the provided details sheet. The detail is automatically placed, and the process is repeated until the entire sheet is filled. Simple modifications to the details to meet specific job requirements complete the sheet. The designer may also call up the details routine while in any design file, thus enabling detail placement anywhere within a set of drawings.

The CADD Details Library should always be considered a "living" document. This means the library may change as often as twice a year. The Center will occasionally announce a *Call For Details*, giving agency designers an opportunity to implement the format in their everyday work habits. After the details are collected, each Center Field Working Group will meet to review and assemble a new generation of the CADD Details Library. The Center will continue to distribute the new libraries and retrieval software. Through evolution, the library will grow to include all the design disciplines with cost incurred only for technical review, reproduction, and distribution.